PROCEEDINGS

OF THE

Hawaiian Entomological Society

VOLUME VII

1927-1930
HONOLULU, T. H.

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Hawaiian Entomological Society

VOL. VII, No. 1 FOR THE YEAR 1927 JUNE, 1928

JANUARY 6, 1927.

The 252nd regular meeting of the Hawaiian Entomological Society was held at the Experiment Station of the H. S. P. A. at 2:30 p. m. Members present besides President Van Zwaluwenburg, who presided, were: Messrs. Bryan, Ehrhorn, Fullaway, Hadden, Illingworth, Mason, Muir, Rosa, Swezey, Willard, and Williams.

The minutes of the 251st meeting were read and approved as corrected. The report of D. L. Crawford, the auditor, of the treasurer's report for the year 1926 was read and accepted.

PAPERS.

Mr. Bryan presented the following paper by title **"Two New Brenthidae in the Bishop Museum Collection,"** by R. Kleine, Stettin, Germany.

NOTES AND EXHIBITIONS

Stictocephala festina (Say).—Mr. Swezey reported collecting specimens of this membracid on *Tribulus cistoides* Dec. 19, 1926 at Barber's Point where it was quite common; two specimens on sugar cane at Puuloa, Dec. 21, 1926; on *Tribulus* and *Lucaena glauca* at Makua, Jan. 1, 1927. These are new records of host plant and also of distribution on Oahu.

Dryophthorus modestus Shp. *on Tree Fern.*—Mr. Swezey reported collecting two specimens of this weevil on tree fern (*Cibotium menziesii*) at Mahena, 1,400 ft. elevation, Maui, Oct. 13, 1926. They were small specimens and were in the rotten bases of dead frond stems. At the time, these were thought to be *pusillus*,

a species inhabiting tree ferns on Oahu. While studying up these specimens, he had reexamined a specimen that Mr. Williams collected on tree fern in Kohala Mts., Sept. 28, 1925, and which at the time had been determined by Mr. Swezey as *D. pusillus* (Proc. Haw. Ent. Soc., VI, No. 2, p. 224, 1926). It was a small specimen and in poor condition. The recent examination of it shows it to be *D. modestus* instead of *pusillus*. In fact, it may be possible that all the specimens labelled *pusillus* in any collections here, are only small specimens of *modestus*. Dr. Perkins mentions in the "Fauna Hawaiiensis" II, p. 143, that he had not met with *pusillus*. He further remarks in Proc. Haw. Ent. Soc., I, p. 45, 1906, that the distinctness of *pusillus* from *modestus* seems doubtful.

Engytatus geniculatus Reuter.—Mr. Swezey reported collecting this little mirid bug on tobacco at Makua, Jan. 1, 1927. Nymphs were also present showing that it was breeding on this plant. It is the first time he had found it breeding on anything but tomato plants.

Green Jassid on Amaranth.—Mr. Swezey reported collecting this insect on Datura at Ewa Coral Plain Dec. 19, 1926, and at Makua, Jan. 1, 1927. Nymphs were present in both instances, showing that it is not strictly confined to the amaranths for breeding.

Lariophagus texanus Crawford.—Mr. Swezey exhibited 2 specimens of this imported bruchid parasite which were collected at Makua, Jan. 1, 1927. This indicates that it has become widespread on Oahu.

Plagiomerus hospes Timb.—Mr. Swezey exhibited specimens of this encyrtid, collected Oct. 12, 1926, on koa trees at Mahena, 1,400 ft. at the north end of the West Maui Mts. It is the first record of this parasite from another island than Oahu.

Bruchus amicus Horn.—Mr. Swezey reported collecting this kiawe weevil at Kawailoa, Nov. 22, 1926, Mt. Tantalus, Nov. 28, 1926, and at Makua, Jan. 1, 1927. Thus it is shown that this weevil is now generally distributed throughout Oahu.

Spalangia cameroni Perkins.—The value of this parasite of the hornfly was indicated by a recent observation of Mr. Swezey. He collected a batch of hornfly puparia from cowdung in the Swanzy

cow pasture on the lower slope of Round Top hill, Nov. 21, 1926. From these, 10 hornflies issued Nov. 25-26; and 52 of the Spalangia issued Dec. 13-28. This is a parasitism of 84%, and the highest that he had ever found for this parasite.

Eupelmus sp.—A specimen of a female *Eupelmus* was exhibited by Mr. Swezey, collected by him on Kahauiki ridge back of Fort Shafter, Nov. 7, 1926. It had a remarkably long ovipositor (8 mm.) at least twice as long as the body of the insect. Longer than any described species.

**Plagithmysus* n. sp.—A fine specimen of what appears to be a new species of *Plagithmysus* was exhibited by Mr. Swezey. It had issued Jan. 3 from a section of trunk of a dead Sideroxylon tree brought in Nov. 11, 1926 from about 2,000 ft. elevation at the base of Mt. Kaala. Five other specimens had previously issued and have been sent to Dr. Perkins for study. A conspicuous distinction from other species of Plagithmysus on Oahu is that the prothorax is armed with a transverse row of large tubercles towards the posterior margin.

Telenomus nawai Ashm.—Mr. Swezey reported that he had recently received this determination by Mr. Gahan for the egg-parasite in the eggs of *Spodoptera mauritia* discovered at the Exp. Station, H. S. P. A. grounds by Mr. Rosa last October, and which was provisionally being called *Phanurus* sp. Its spread about Honolulu has been previously reported. On Dec. 17, 1926, Spodoptera eggs parasitized by this insect were found on a Ficus tree near the sugar mill at Waipahu. On Dec. 29, 1926 at the Hauula municipal park parasitized Spodoptera eggs were found on leaves of a young kamani tree. The adult parasites themselves were observed at work on several clusters of Spodoptera eggs. These records show this parasite to be already widely distributed on Oahu.

Prosoplus bankii (Fabr.).—Mr. Bryan exhibited grubs and adults of this longicorn beetle, bred from pigeon-pea stems brought to him by Mr. K. O. Moe from the mauka pasture, Kamehameha

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* Description of this beetle under the name *Plagithmysus muiri* is included in a paper by Dr. R. C. L. Perkins in Proceedings of the Hawaiian Entomological Society, VI, No. 3, p. 476, 1927.

Schools, Kalihi, Oahu, Aug. 25, 1926. The stems of many plants were badly infested. The distribution of this immigrant beetle seems to be quite general in Hawaii. It was recorded in the Fauna Hawaiiensis (Vol. 2, page 114) as "on the introduced Acacia (Prosopis sp.)"—meaning the algaroba. Bridwell records the beetle as attacking Euphorbia wood, Crotolaria and klu pods and various leguminous vines (Proc. Hawaiian Ent. Soc. IV, pp. 320, 327). He also describes its parasitism by Scleroderrnus wasps (Proc. Hawaiian Ent. Soc. IV, pp. 294, 296). The Bishop Museum has specimens from Napoopoo, Hawaii, 8-9-19, ex Capparis and 8-8-19, ex dead cotton (Swezey); Kealakekua, S. Kona, Hawaii, 8-12-19 (Swezey); Ewa Coral Plain, Oahu, 8-10-19 and 1-29-22 (Bryan); Koko Head, Oahu, 12-20-19, ex Wiliwili pods (*Erythrina monosperma*) (Bryan); Kalihi, Oahu 2-29-22, (Bryan); and Honolulu, 1924, (Cartwright).

Mr. Swezey stated that he had observed the grubs of this beetle in dead stalks of pigeon-peas in his garden. Mr. Fullaway reported getting them from dead citrus.

Termites.—Mr. Ehrhorn made a few remarks about Termites. On December 29, 1926, he found a nest in the basement of the McInerny Building and brought the wood containing them to Mr. Muir for use in nematode work. In this colony the nymphs were plentiful but there were very few soldiers. He placed new wood over the nest so as to attract the termites and show a runway in the soil which was not found at the time. On January 5, 1927 he removed the board from the ground and found a good runway and the termites had eaten quite a large channel in the board—showing their rapid work. On January 4th, the top of a large pepper-tree infested by termites on the old mission property, King and Kawaiahao Sts., was blown off and some of the carton nest had fallen to the ground. Upon investigation, Mr. Ehrhorn found that the stump left standing was at least 8 feet tall and that the entire hollow center was filled with carton nest. Photos were taken and will be shown next meeting. No nymphs were observed.

Melophagus ovinus (Linn.)—Mr. Muir exhibited a specimen of this "sheep tick" which was found by Dr. Lyon on a bag of seeds

from Hawaii, December 1926. The seeds were gathered in a strip of forest adjacent to a sheep run in Honohina. This is the first record of finding a specimen of this hippoboscid fly in Hawaii.

Samoan Elateridae.—Mr. Van Zwaluwenburg exhibited a collection of click beetles from Samoa composed of specimens collected by Dr. P. A. Buxton and Mr. G. H. E. Hopkins of the London School of Hygiene and Tropical Medicine, and Messrs. Swezey, Wilder and Bryan of the Bishop Museum staff. Among the material Mr. Van Zwaluwenburg had identified eight genera and fifteen species, including two new genera and six new species. The specimens are being returned to Dr. Buxton and the Bishop Museum.

FEBRUARY 3, 1927.

The 253rd regular meeting of the Hawaiian Entomological Society was held at the usual time and place, with President Van Zwaluwenburg in the chair. Other members present were: Messrs. Bryan, Ehrhorn, Fullaway, Hadden, Illingworth, Muir, Swezey, and Williams. Mr. H. S. Kemble and Miss Gertrude Henderson were present as visitors.

In the absence of Mr. Willard, Mr. Bryan was asked to act as Secretary. The minutes of the 252nd regular meeting were read and approved.

A memorandum from Mr. Willard, Secretary-Treasurer, reported that he had forwarded to the Zoological Society of London the amount of 5 pounds, 13 shillings, and 9 pence, which represented donations by the members of the Society toward publishing volume 61 of the Zoological Record.

Mr. Bryan was asked to attend to the business of the Secretary and Treasurer during Mr. Willard's absence.

Mr. H. S. Kemble was nominated for membership.

PAPERS.

Mr. Bryan presented a paper by Mr. J. R. Malloch, entitled **"The Hawaiian species of the genus Lispocephala Pokorny (Diptera, Anthomyidae)."**

NOTES AND EXHIBITIONS.

Cryptogonus nigripennis Weise.—Mr. Fullaway exhibited specimens of this lady-beetle from Guam, which had been determined by the Imperial Bureau of Entomology, London. This species is credited with the control of *Aspidiotus destructor* on the coconut palms in Guam.

Lyctoxylon japonum Reitter.—Mr. Swezey reported to have recently determined as this insect, four beetles reared from a bamboo fan by Dr. Lyon, May 13, 1913. No other records of it are known in Hawaii.

Mr. Fullaway stated that he had found lyctids in furniture in Hawaii.

Nesithmysus bridwelli Perkins.—A fine specimen of this longicorn beetle was exhibited by Mr. Swezey. It had issued from Pelea wood brought by him from Mt. Kaala, Nov. 11, 1926. A dying Pelea tree was found at about 3,000 feet elevation. Cutting into it, several large longicorn larvae were found, and pieces of the branches containing these were brought in for rearing. Only the one beetle has matured so far. It was on January 24. The Pelea tree stood in the vicinity of where the only two other specimens of this insect were collected by Messrs. Swezey and Bridwell, July 4, 1916 and July 17, 1917, on ohia lehua and Broussaisia respectively. The host tree of the beetle is now proven.

Ephestia cautella Walker.—A very heavy infestation by this moth of rolled barley in a feed warehouse at Waipahu was reported by Mr. Swezey. He and Mr. Hadden had investigated it December 17, 1926. In looking up the identity of the moth it was found to be the same as a large series in the H. S. P. A. collection under the name *Ephestia elutella.* It is not known how the error in previous identification occurred. *E. elutella* is recorded in the "Fauna Hawaiiensis", and no doubt has occurred here. But it is now apparent that the species that has been known here commonly of recent years, infesting many kinds of cereal products and dried fruits, and known as *elutella,* is *cautella,* the same species that is such a pest in stored products on the mainland. The two species are separated by the male having two subbasal tufts of hair on the hind wings in *elutella,* whereas in *cautella* there is but one.

Termites.—Mr. Ehrhorn showed photographs of the pepper tree with Coptotermes nest, 13 feet long filling its entire stump, which he reported at the last meeting. He also exhibited a piece of wood showing the work of Coptotermes done in 8 days, and a stake which had been in the ground, as a trap, for one month in an infested district. This stake showed a very severe attack, and must have been in soil which was very badly infested with Coptotermes.

Mr. Fullaway exhibited what he thought to be a neoteinic female Coptotermes. Some little discussion followed, because the specimen showed no wing pads.

Mr. Swezey exhibited an as yet unchitinized soldier of Calotermes. There followed a discussion of what were the nymphal stages of a termite, and how the immature stages of soldiers differed from those of other casts.

Mr. Ehrhorn requested that the members try to note the ratio between males and females at the time of swarming termites.

North American Sarcophagidae.—Mr. Bryan exhibited specimens of seven species of these flies, received in exchange for Hawaiian Sarcophagidae from Mr. David G. Hall, of the University of Arkansas.

South Pacific Mosquitoes.—Mr. Bryan exhibited a collection of named mosquitoes from Samoa and other South Pacific groups received at the Bishop Museum from Dr. P. A. Buxton. Part of the specimens had been collected by Messrs. Swezey, Wilder, and Bryan, and had been sent to London with other Samoan material to be worked up in the preparation of an Insect Fauna of Samoa. The rest had been collected by Dr. Buxton and Mr. G. H. E. Hopkins. The collection included a series of microscope slides of larvae and pupae. Among these were specimens of the unique submarine Chironomid fly, *Pontomyia natans* Edwards, discussed by Dr. Buxton in the Proceedings of the Zoological Society of London, 1926, pages 807-814.

Proterhinus samoae Perkins.—Mr. Swezey stated that a letter from Dr. Perkins had contained the news that he had found specimens of this bark beetle in the collections of Buxton and Hopkins from Samoa. The species had been described from a single specimen bred from the woody stem of a coconut imported as seed from

Samoa. As Proterhinus was supposed to be an endemic Hawaiian genus this species was regarded with some doubt by local entomologists. This new find, together with the discovery of Proterhinus on Enderbury Island of the Phoenix group by Mr. Bryan indicates a wider distribution for the genus.

MARCH 3, 1927.

The 254th regular meeting of the Hawaiian Entomological Society was held at the usual time and place, with President Van Zwaluwenburg in the chair. Other members present were: Messrs. Bryan, Ehrhorn, Fullaway, Hadden, Muir, Pemberton, Rosa, Swezey, Willard, and Williams. There were four visitors present: H. S. Kemble, A. D. Shamel, W. J. Mueller, and Miss G. Henderson.

The minutes of the 253rd regular meeting were read and approved.

Mr. H. S. Kemble was elected to active membership.

Mr. Willard, who did not act as secretary owing to his having to leave early, read a communication from the Zoological Society of London, thanking the Society for their contribution to the Zoological Record.

The order of business was suspended and Mr. Pemberton was asked to speak concerning his two years trip through the East Indies in search of parasites. This he did in a very entertaining manner, relating how he had spent a year in the Philippines searching for parasites of the mole cricket and Rhabdocnemis weevils, and collecting seeds; and how he had then visited Java, Celebes, certain small volcanic islands between Celebes and the Philippines, and North Borneo. In each of these localities he had found much the same general complex of parasites controlling the local species of Rhabdocnemis in the sugar palms and sago swamps.

PAPERS.

Mr. Bryan presented a paper by Prof. D. L. Crawford, on **"The Psyllidae of Fiji and Samoa."**

Mr. Pemberton discussed and later furnished a paper on **"A Thysanuran predatory on eggs and immature forms of termites in Borneo."**

NOTES AND EXHIBITIONS.

Euplectrus platyhypenae How.—Mr. Swezey reported finding this armyworm parasite established at Koko Head, February 22, 1927. This is the first recovery of it on Oahu, outside of the Experiment Station grounds in Honolulu. Of six caterpillars of *Spodoptera mauritia* found, four were parasitized by Euplectrus (66 percent). Of one hundred twelve caterpillars of Cirphis unipuncta collected, fifteen were parasitized (13 percent). He also recovered it on the summit of Punchbowl, February 26th. Only one caterpillar was found (*Spodoptera mauritia*) and it had a cluster of Euplectrus eggs.

**Philodoria lysimachiella* n. sp.—A series of specimens of this beautiful little Tineid moth was exhibited by Mr. Swezey. He had reared them from mines in the leaves of *Lysimachia rotundifolia* collected January 16, 1927, in the Waianae mountains, a little to the south from Kolekole Pass. The injured leaves were quite numerous on a few clumps of bushes found growing near together. Ten specimens were reared out. This appears to be an undescribed species, nearly related to the species mining the leaves of Suttonia, and almost identical with a specimen reared from Lysimachia on Molokai, December, 1925.

Buprestus aurilenta Linn.—Mr. Fullaway exhibited a specimen of this buprestid beetle, which had been picked up on the floor of the Board of Agriculture and Forestry laboratory on King Street. It had undoubtedly issued from specimens of wood. A specimen had also been found in the attic of the Waterhouse home in Nuuanu valley.

Thysanura and Collembola.—Mr. Van Zwaluwenburg stated that Dr. J. W. Folsom had made a report on some Thysanura and Collembola taken in Hawaiian cane-field soil samples. None of them are recorded in the Fauna Hawaiiensis. They are as follows:

1. *Isotomodes* sp. Probably new. This is the species so num-

* Described on page 188 of this issue [Ed.]

erous in cane soils on all the islands of the group. It makes minute pits in tender new roots. Dr. Folsom writes that this a rare and little known genus, interesting because of its generalized structure.

2. *Folsomia* sp. n. near the cosmopolitan *F. funetaria* L. Island of Hawaii.

3. *Acharutes* sp.

4. *Campodea* sp.

5. *Lepidacyrtus* sp.

6. *Entomobrya* (2 spp.).

7. *Smynthurid* probably a new species.

8. *Japyx* sp. Probably new.

Archytas cirphis Curran.—Mr. Williams reported finding this Mexican tachinid in the grounds of the Lihue, Kauai, hotel, on the Lihue plantation, at Kilauea and in the mountains, elevation 2,000 feet, Kauai, during February.

Banana Culture in Central America.—Mr. Shamel gave some informal impressions gained during his investigations of banana raising in Guatamala and other parts of Central America.

APRIL 7, 1927

The 255th regular meeting of the Hawaiian Entomological Society was held at the H. S. P. A. Experiment Station at 2:30 p. m. Owing to the late arrival of the president the meeting was presided over by the vice-president, Mr. E. H. Bryan. Other members present were: Messrs. Fullaway, Hadden, Kemble, Pemberton, Rosa, Swezey, Van Zwaluwenburg, Willard and Williams.

Minutes of the 254th meeting were read and approved as corrected.

PAPERS

"Insect Fauna of *Panicum torridum*, a Native Grass in Hawaii," by O. H. Swezey.

"Nematodes Associated with Termites in Hawaii, Borneo and Celebes," by C. E. Pemberton.

"The Kamehameha Butterfly, *Vanessa tammeamea* **Esch,"** by F. X. Williams.

"The Sphecid Wasp, *Podalonia violaceipennis* **(Lep.)"** by F. X. Williams.

NOTES AND EXHIBITS

Anomala orientalis (Waterhouse).—Mr. Van Zwaluwenburg reported Anomala adults found feeding in Dahlia blossoms in a garden at Pearl City Fruit Company.

Termites.—Mr. Van Zwaluwenburg reported observing a flight of termites on lower Fort Street, March 29, 1927.

Engytatus geniculatus Reuter.—Mr. Fullaway reported observing this bug sucking the flower stems of tomatoes at the U. S. Experiment Station, causing the flowers to fall off and the fruit not to set.

Pseudaonidia clavigera Ckll.—Mr. Fullaway exhibited a twig from a grapevine grown at the U. S. Experiment Station which had been attacked and killed by this scale. He stated that this scale mines under the bark and destroys the tissue.

Fiorinia nephelii Mask.—Mr. Fullaway reported finding this scale on litchi in Honolulu. This being the first time it has been recorded on this host here.

Tricentrus albomaculatus Distant.—A specimen of this membracid was exhibited by Mr. Swezey, collected by him on *Cassia bicapsularis* in Waimea Valley on the north side of Oahu, March 27, 1927. It is the farthest from Honolulu that it has been yet recorded, only having been recorded from Manoa, Tantalus, Honolulu and vicinity.

Archytas cirphis Curran.—Mr. Swezey reported having bred a specimen of this tachinid from *Cirphis unipuncta* collected at Koko Head, February 22, 1927. The fly issued March 28th. It is the first record of breeding this fly from a caterpillar caught in the field.

Banza unica (Perk.).—A specimen of this locustid was exhibited by Mr. Swezey, collected by him on Puu Hapapa, Waianae Mts., Jan. 16, 1927. It has not been previously recorded from the Waianae Range. Specimens have been taken but rarely in the Southeast Koolau Range.

Megaphragma mymaripenne Timb.—Mr. Swezey exhibited a slide mount of two specimens of this minute trichogrammatid, being the only specimens collected since those obtained by Mr. Pemberton at Mountain View, Hawaii, January, 1920, which are the types of the species. The latter were associated with thrips. The present specimens were, also, on a Croton bush at the Experiment Station, H. S. P. A. It may possibly be a parasite on the eggs of thrips.

Aedes albopictus (Skuse).—Mr. Swezey called to attention that Mr. Muir had recently noted in a paper by Edwards (Bull. Ent. Research, XVII, p. 101, 1926) that the day mosquito which we have known as *Stegomyia scutellaris* is *Aedes albopictus*. Points of difference were indicated by Edwards in a previous paper (Bull. Ent. Research, XIV, p. 371, 1924). China or Japan is indicated as the source from which this mosquito came to Hawaii.

MAY 5, 1927

The 256th meeting of the Hawaiian Entomological Society was held at the Experiment Station, H. S. P. A., at 2:30 p. m. President Van Zwaluwenburg presided. Other members present were: Messrs. Bryan, Ehrhorn, Fullaway, Giffard, Hadden, Kemble, Mason, Pemberton, Rosa, Swezey, Willard and Williams. Prof. S. Inomata of the Agricultural College, Tottori, Japan, was a visitor.

The minutes of the 255th meeting were read and approved.

PAPERS

Mr. Swezey presented the following paper for Prof. Crawford:

"A New Psyllid from Maui."

BY D. L. CRAWFORD

"Biological Notes on Scolopendrella sp., a Pest of Pineapple Roots."

BY J. F. ILLINGWORTH

NOTES AND EXHIBITIONS

Dirhinus giffardii Silvestri.—Mr. Fullaway exhibited a specimen of this fruit fly parasite which was captured by Mr. Ehrhorn on April 29th at the warehouse of the American Factors, Fort and Halekauwila Sts., in Honolulu.

Nutgrass weevil.—Mr. Rosa exhibited a specimen of the nutgrass weevil which was collected in a bunch of nutgrass April 29 that was cut about 20 yds. away from where the original colony was liberated on May 9th, 1925. This is the first recovery of this weevil, and indicates that it has become established.

New Coccinellid.—Mr. Swezey exhibited a minute ladybeetle which he had reared from *Psudococcus filamentosus* (Ckll.) collected on a *Ceratonia* tree at Moanalua, Oahu, March 30, 1927. It seems to be an unrecorded species here. Mr. Fullaway had examined it and found it different from any of the several species that he had introduced for mealybugs in recent years.

New insect records for Hilo.—Mr. Swezey reported that in examining some collections of insects by Hilo school boys, the following were noted that had not been recorded from Hilo or the island of Hawaii:

Anthomyia bisetosa Thoms.

Sybra alternans Wied.

Oxacis collaris Shp.

Ananca sinensis Gemm.(?)

Among these specimens were also some of *Archytas cirphis* Cur., *Scolia manilae* Ashm., and *Notogonidea luzonensis* Rohwer, which have been already known to have become established, and this indicates that they are becoming more common.

Spodoptera exigua (Hüb.).—A caterpillar of this moth was reported by Mr. Swezey as feeding on a flower head of a pink

garden Aster. It was burrowing in among the disk flowers and feeding on them. Apparently a new record of food plant for this species in Hawaii.

Chloridea obsoleta (Fabr.).—Mr. Swezey reported the finding of a caterpillar of this moth feeding in an ear of green corn. So far as he knew, this is the first record of its feeding on corn in the Hawaiian Islands.

Lyctus linearis Goeze.—Mr. Swezey called to attention that in a recent letter from Dr. Van Dyke, he pointed out that his identification as *Lyctus linearis,* of some beetles sent from Honolulu and as recorded in Proc. Haw. Ent. Soc., VI, No. 2. p. 242, 1926, was in error. He had made a further study of it and related species on account of more material having been sent him, and finds that *L. brunneus* Steph. is the right name for this beetle. Hence the record given above is to be corrected, and *L. linearis* should be removed from the immigrant list on p. 343.

Coptotermes formosanus Shiraki.—Mr. Swezey quoted from a letter from Mr. S. F. Light, dated Jan. 11, 1927, to the effect that he was working on a paper on the Philippine *Coptotermes,* in which it will be shown definitely that the *Coptotermes* in Hawaii is *formosanus.*

Apterocis vagepunctatus Blkb.—Two specimens of this beetle were exhibited by Mr. Swezey, collected in dead Pelea at Lanipo, Oahu, June 11, 1924. It is a species collected originally by Blackburn in the mountains near Honolulu and none recorded since.

Oodemas insulare Blkb.—A specimen of this beetle was exhibited by Mr. Swezey, collected by him on Puu Hapapa, Waianae Mts., Jan. 16, 1927. It was originally collected by Blackburn and none recorded since.

Derobroscus micans Sharp.—Two specimens of this rare carabid beetle were exhibited by Mr. Swezey, collected by him on Mt. Kaala, Feb. 6, 1927. It was collected originally by Dr. Perkins on the lee side of Waianae Mts. A single specimen is at the Bishop Museum. This genus is strikingly different from other Hawaiian Carabidae. It has only two other species, both on Oahu, and no representatives of them at the Museum.

Nesithmysus forbesii Perk.—Specimens of this cerambycid beetle were exhibited by Mr. Swezey, who had reared them from pieces of Pelea trees brought from Olinda, Maui, Feb. 10, 1927. The larvae were found boring down in the pith from tips of living twigs, and causing their death. Very few Pelea trees were in the region where these were collected, and all seemed to be affected. Some trees 3 or 4 inches in diameter had holes at various places where beetles had issued. The branches had been crippled by the boring of the larvae, but not killed. Four beetles issued from March 21 to April 6. Only the unique type has been previously known. It was collected by Forbes on a Pelea tree at Haipuena, the same general region on the windward side of Haleakala in 1920.

Two specimens of a new species of Nesithmysus near to *N. bridwelli* of Mt. Kaala, Oahu, issued from Mr. Swezey's Olinda material on March 5th and April 1st.

Termites.—Mr. Ehrhorn exhibited specimens of wood (ash) taken out of passenger coaches of the O. R. & L. Railroad which had been attacked by *Cryptotermes piceatus* Sny. These coaches had been treated by dry heat and all of the *C. piceatus* were found dead after one and one-half hours' exposure to 150° F. He explained that the chamber was built large enough to take two freight cars or one passenger coach and that the results of the above treatment were perfect. He showed, also, a piece of timber from a table infested with *C. piceatus* and which had been treated with Paris green about a month previously. Paris green had been blown into an opening in one of the tunnels and when the channels were examined, it was found that the poison had been carried quite a distance by the termites and that all the insects in the table were dead.

Mr. Ehrhorn showed, also, the butt end of a small telephone pole which had been attacked by *Coptotermes*. This exhibit showed how the termites avoided touching any portion of the wood which had been treated with creosote.

Mr. Bryan reported a flight of *Coptotermes* at the University of Hawaii on the evening of May 2, 1927.

JUNE 2, 1927

The 257th regular meeting of the Hawaiian Entomological Society was convened at 2:30 p. m. at the H. S. P. A. Experiment Station. President Van Zwaluwenburg presided and other members attending were: Messrs. Ehrhorn, Fullaway, Kemble, Mason, Rosa, Swezey, Willard and Williams.

The minutes of the last meeting were read and approved as corrected.

The following paper was presented by Mr. Swezey:

"Hawaiian Thysanoptera."

BY DUDLEY MOULTON

NOTES AND EXHIBITIONS

Sybra alternans Wied.—Mr. Swezey reported rearing this longicorn beetle from stems of jack beans from Pearl City Fruit Co. where, on December 11, 1926, Messrs. Muir and Van Zwaluwenburg found a patch of these beans dying, and having coleopterous borer larvae at base of plants. Some pieces of plants were brought in. Feb. 12, one adult *Sybra alternans* issued, proving the species.

Neoclytarlus immundus (Sharp).—Mr. Swezey called to attention that among some specimens of Mr. Giffard's that have recently been studied by Dr. Perkins and returned, there were two specimens of this longicorn beetle. It was described in the genus Plagithmysus by Dr. Sharp, but Dr. Perkins, in a letter of Jan. 9, 1927, has now shifted it to Neoclytarlus.

Schistoceros cornutus Pall.—Mr. Swezey exhibited some branches of Bougainvillea brought in from Schofield Barracks, May 11, 1927, by Mr. McEldowney containing borings of this beetle. From one of the borings two beetles had been taken. The beetles had bored into living branches, entering at the angle above a smaller side branch.

Paratenodera sinensis (Sauss.).—Mr. Ehrhorn reported four instances of this mantis being brought by individuals for identification, two from Manoa, one from Punahou and one from Kaimuki.

Unidentified moth.—Mr. Fullaway exhibited a specimen of an unidentified moth found by Mr. Whitney in leguminous tree seeds imported from New Zealand.

JULY 7th, 1927.

The 258th regular meeting of the Hawaiian Entomological Society was held at the Experiment Station, H. S. P. A., at 2:30 p. m., President Van Zwaluwenburg presiding. Other members present were: Messrs. Bryan, Ehrhorn, Fullaway, Illingworth, Mason, Rosa, Swezey, Whitney, Willard, and Williams. Noel H. Krauss, student assistant at the Bishop Museum was a visitor.

The minutes of the previous meeting were read and approved.

PAPERS

"Notes on the Tomato Leafminer, Phthorimaea Lycopersicella Busck, in Hawaii."

BY O. H. SWEZEY.

"Zwei neue Brenthiden aus der Sammlung der Exp. Stat. of the Hawaiian Sugar Planters' Association,"

BY R. KLEINE, STETTIN, GERMANY.

"List of Brenthidae in the Collection of the Experiment Station of the Hawaiian Sugar Planters' Association,"

BY O. H. SWEZEY.

NOTES AND EXHIBITIONS

Bactra truculenta Meyr.—Specimens of this nutgrass borer were exhibited by Mr. Swezey, collected by him May 19th at light at Pawaa Junction and June 27 in his garden at 2048 Lanihuli Drive, Manoa Valley. In the latter place the larvae were also found boring in stems of nutgrass. He reported also finding in a patch of nutgrass by the roadside on Manoa hill that about ¼ of the nutgrass stems were infested by larvae of this month. These are the first records of the recovery of this introduced moth anywhere away from the grounds of the Experiment Station, H. S. P. A., where it has been known to be established since January, 1926.

Neotermes connexus Snyder.—Mr. Ehrhorn reported the finding of this termite in koa by Mr. William Meinecke on June 29th, 1927 on Waipa ridge, Lumehai, Kauai, 1,200 to 1,250 feet elevation. He also exhibited eggs of this species which were collected on Tantalus, June 25th, 1927. He stated that adults, and nymphs, and larvae in all stages were found at the same time.

Kalotermes immigrans Snyder.—Mr. Ehrhorn reported also the finding by Mr. Meinecke on June 29th, 1927, specimens of this termite in Kadua stems at the same locality on Kauai which is mentioned above. He mentioned the fact that these specimens were smaller and not quite as stout as true *immigrans* and might be *K. majoriae* Snyder.

Queen cell of termite.—Mr. Ehrhorn exhibited a queen cell found in a kiawe stump at Washington Place, Honolulu, June 16th, 1927; also some carton material found in the same nest and which contained white fungus growths.

Hyposoter exiguae (Viereck).—Mr. Fullaway reported finding this ichneumonid on Molokai, June 28th, 1927.

Samoan insects.—Mr. Bryan exhibited a number of specimens of Samoan insects which had been returned from various specialists where they had been sent for identification. He remarked that several type specimens had been returned.

There was a general discussion on termites and the susceptibility of the tomato to attack by the Mediterranean fruit fly.

AUGUST 4, 1927.

The 259th regular meeting of the Hawaiian Entomological Society was held at the usual time and place, President Van Zwaluwenburg in the chair. Other members present were: Messrs. Bryan, Ehrhorn, Fullaway, Illingworth, Mason, Rosa, Swezey, and Williams.

In the absence of Secretary and minutes, Mr. Bryan was asked to act as Secretary, and the reading of the minutes was postponed.

Mr. Swezey, reporting for the Outing Committee, asked the

members present to express their choice between Waikane-Kahana Trail, Mt. Kaala, and Pupukea Trail, as a locality to visit, and to decide on the date. After some discussion it was decided to visit the Kahana-Waikane region, and Sunday, Sept. 4th was set as the day.

NOTES AND EXHIBITIONS

Notes on Molokai Insects.—Mr. Swezey made some general remarks on a recent field trip to the Molokai mountains with Mr. Bryan, and gave the following first records:

Atractamorpha ambigua Bol.—This grasshopper was collected in a tomato patch at Kainalu, Molokai, July 23rd. It is apparently the first record of its occurance on that island. It has hitherto been known only on Oahu and Kauai.

Lysiphlebus testacipes Cress.—This parasite was reared from a parasitized aphid collected on Phaseolus by the roadside, at Kainalu, Molokai, July 23. It is the first record of the occurrence of this parasite on Molokai.

Mr. Swezey also presented the following list of the trees found infested by the mountain termite, *Neotermes connexus* Snyder:

Straussia, Perrotettia, Metrosideros, Byronia, Coprosma, Freycinetia, Clermontia, Tetraplasandra, Gouldia, Broussaisia, guava and lantana.

In all cases the termites were in dead trunks or branches.

Angitia blackburni (Cam.).—Mr. Fullaway reported that he had bred this parasite from the tomato splitworm, *Phthorimaea operculella* (Zell.).

Termite notes.—Mr. Ehrhorn exhibited specimens of limbs of trees damaged by *Neotermes connexus* and *Kalotermes immigrans.* He is studying the damage done to trees of our forests. He quoted from a letter from Dr. Thos. E. Snyder regarding termite attack on mesquite, which noted that the heartwood of our algaroba which had been sent him was not attacked. *Coptotermes formosanus* does eat the dead heartwood of algaroba, from Mr. Ehrhorn's observations. Ehrhorn also gave the results of a count of winged *Cryptotermes piceatus,* which he had sent to Dr. Snyder,

the ratio of which was 27 males to 23 females. He also read a letter on some observations of Snyder on the male and female ratio of adult termites. Ehrhorn reported finding *Kalotermes immigrans* Snyder in dead Lantana on the slopes at Waimanalo bay, above the Makapuu trail.

A discussion of the poisons used in the control of termites brought out the suggestion that Calcium cyanide, which is used against pineapple root insects and other pests, might be effective.

New Moth.—Dr. Williams exhibited specimens of a new Plusia-like moth, which he had reared from Osteomeles, a native plant, on the Palolo side of Manoa Valley. The caterpillars are green with white lines.

Mosquito Trap.—Mr. Ehrhorn spoke concerning the mosquito trap which has been devised by Mr. Wm. Weinrich. The plan of the trap is to entice the mosquito to lay her eggs in a specially prepared tub, which is so arranged that the larvae are trapped. As many as sixty egg masses a day of approximately 200 eggs each, have been laid in some of the tubs.

SEPTEMBER 1, 1927

The 260th regular meeting of the Hawaiian Entomological Society was held at the usual place at 2:30 p. m. President Van Zwaluwenburg in the chair. Other members present were: Messrs. Bryan, Giffard, Kemble, Mason, Rosa, Swezey, Willard, and Williams. Noel H. Krauss, student assistant at the Bishop Museum, and Matsugi Maneki, a student of entomology of the University of Hawaii, were visitors.

The minutes of the July and August meetings were read and approved.

Mr. Swezey reported for the Outing Committee that those who wish to attend the hike and picnic at Waikane, assemble at the Experiment Station, H. S. P. A., at 7:30 a. m., September 4th.

NOTES AND EXHIBITIONS

Bactra truculenta Meyrick.—The spread of this introduced nut-

grass borer in Honolulu was reported by Mr. Swezey, who in recent scouting had found it in Manoa Valley as far as Armstrong St.; on the University campus and all across the University farm fields; Bingham Tract; Kuhio School; Territorial Fair Grounds; Makiki Valley at reservoir; U. S. Exp. Station; McKinley High School; Thomas Square; and to the west as far as Kamehameha School grounds. In most places not abundant, but could be readily found by a little search. Sometimes the moths were observed, but usually it was the larva in nutgrass stem showing "dead heart."

**Nutgrass weevil.*—Mr. Swezey reported having recovered an adult and several larvae of this weevil in nutgrass at the U. S. Exp. Station, Aug. 31, 1927. This is the first recovery away from the Exp. Station H. S. P. A. grounds where it was found to have become established in May, 1927. It was introduced at the same time as the nutgrass moth borer, but has been slower in getting established and dispersed. Apparently it will become more efficient in checking nutgrass than the moth for its larva more completely eats the nut than does the moth larva.

Anomala orientalis (Waterh.)—Mr. Swezey recorded the catching of a female beetle of this species which flew into a travelling automobile on the Kamehameha Highway near field 37 of the Oahu Sugar Co., Aug. 14, 1927, at about 6 p. m. It is an illustration of how this pest could be spread, for it is the main travelled highway to the opposite side of the island and traverses for at least 4 miles the region that at one time was badly infested with *Anomala.* The feature that operated against spreading the infestation in this way at that time was that the females of this beetle did very little flying before laying their eggs, as was ascertained from examination of the female beetles whenever caught in flight or at flowers. In the case now mentioned the female contained no eggs.

Nesithmysus bridwelli Perkins.—Mr. Swezey exhibited pieces of wood of Pelea trees containing the larvae of this large cerambycid beetle, collected on Mt. Kaala, Aug. 14, 1927. He also reported

* This weevil has been named and described as *Athesapeuta cyperi* by Dr. Marshall in Bull. Ent. Research, 18, Pt. 3, p. 268, 1928. [Ed.]

finding Pelea trees with numerous large exit holes probably of a similar beetle, on Waipio Ridge, Aug. 28, 1927.

Xiphidiopsis lita Hebard.—Mr. Swezey reported having observed this phasgonurid on the Kuliouou Ridge, Aug. 7; at the H. S. P. A. nursery at Wahiawa, Aug. 17; and on the Waipio Ridge near the forest, Aug. 28. These observations indicate that it is getting widely spread on Oahu, where it was first noticed in Honolulu, Sept. 11, 1923. Mr. Giffard stated that he had captured a female specimen of this species in his garden on the volcano road, island of Hawaii, 3900 ft.

Latrodectes mactans.—Mr. Kemble reported finding two specimens of this poisonous spider which he collected on the Waianae beach, July 31, and August 21, 1927, respectively. Mr. Bryan also exhibited some specimens of this spider from Ewa plantation and stated that the employees of the plantation have reported the spider very numerous in cane trash and under loose pieces of coral rock, on the plantation.

Xylocopa varipuncta Patton.—Mr. Krauss exhibited a specimen of this carpenter bee collected on the Island of Maui. This specimen showed distinct hermaphroditic characters in its coloring. The predominant color was the black of the female, but there was considerable of the orange yellow coloring of the male present. Mr. Krauss left this specimen with the members of the society for examination of the sexual organs for hermaphroditic characters.

Termites.—Mr. Swezey called attention to the frequency with which nymphs of the soldiers were being found in termite nests. He was of the opinion that this was due to more careful searching rather than an increase in abundance of the nymphs.

Carabids.—Mr. Giffard exhibited a number of species of the Cyclothorax group of Carabids from Oahu and Hawaii.

OCTOBER 6, 1927

The 261st regular monthly meeting of the Hawaiian Entomological Society was held at the Experiment Station, H. S. P. A.,

at 2:30 p. m. President Van Zwaluwenburg presiding and other members present were: Messrs. Bryan, Giffard, Illingworth, Pemberton, Rosa, Swezey, Willard and Williams. Prof. Otto Degener of the University of Hawaii was present as a visitor.

The minutes of the last meeting were read and approved.

Mr. Swezey reported for the committee in charge of the excursion on Sept. 4th, that fourteen persons attended the outing. Most of the party hiked to the top of the ridge back of Kahana valley and a very enjoyable time was had by all of those attending, and interesting insects were collected by several.

PAPERS

"Insect Fauna of the Silversword and Greensword,"

BY O. H. SWEZEY AND OTTO DEGENER

NOTES AND EXHIBITIONS

Carabids.—Mr. Giffard exhibited several boxes containing a number of species of Carabids from Molokai, Lanai and Kauai, together with a large series of the two large species *Barypristus incendiarius* and *B. rupicola* from Hawaii and Maui.

Glyptocolastes bruchivorus Crawford.—Mr. Swezey recorded the breeding of this parasite from *Bruchus limbatus* feeding in seeds of *Acacia confusa* picked from a tree on the campus at the University of Hawaii, Sept. 24, 1927. Of 180 seeds collected, 117 had eggs of the bruchid, 50 had exit holes, and only 13 of the seeds were free from weevil attack—7.2%.

From the infested seeds, 20 bruchids issued and 76 of the parasites, which is an 80% parasitism.

Zorotypus sp.—Mr. Swezey exhibited specimens of this rare insect collected by him in rotten koa log on Waipio Ridge, Aug. 28, 1927, and reported also having secured a specimen in a rotten koa log at about 2600 feet elevation on the trail up Mt. Kaala, Aug. 14, 1927. Comparison had not yet been made to determine whether these were all the same species or whether they were the same as *Z. swezeyi* that occurs in the Waimea plateau on Kauai. He also reported that Dr. Williams had collected this latter species

in a rotten lehua stump on the Summit camp trail, Kauai, Feb. 13, 1927. This is a different part of the island from where the insect was already known to occur.

Insects collected at Kahana, Sept. 4, 1927.—Mr. Swezey exhibited the insects of interest that he collected on the ridge above Kahana Valley, Sept. 4th, the day that the Entomological Society had its field day there.

From rotten logs:

14 *Dryophthorus crassus* Shp.
3 " *declivis* Shp.
6 " *modestus* Shp.
3 " *insignis* Shp.

From *Broussaisia*:

9 *Proterhinus phyllobius* Perk., a leafminer.
6 " *swezeyi* Perkins, a large species in dead twigs.
1 *Oodemas aenescens* Boh. in dead twig.
1 *Nesophrosyne* sp., on leaves.

From *Dubautia*:

5 *Gracilaria epibathra* Walsm., a leafminer.

From *Smilax*:

2 *Neoclytarlus* n. sp., reared from dead stems.

Collected at the same place by Mr. Ehrhorn:

3 *Parandra puncticeps* Shp.
2 *Dryophthorus crassus* Shp.
2 " *insignis* Shp.
1 *Oodemas aenescens* Boh.
2 *Bembidium* sp.
1 *Metromenus* sp.

Laboulbenia sp.—Mr. Swezey exhibited two specimens of *Derobroscus* sp., a native carabid, collected by himself and Dr. Williams at Kahana Sept. 4, 1927, both specimens having growths of *Laboulbenia* somewhere on thorax and elytra. This is a host for these peculiar plants, that is not in lists previously recorded.

Bruchid from California.—Mr. Pemberton exhibited several

specimens of a Bruchid resembling *Bruchus prosopis* together with an undetermined parasite reared from this material collected at Mecca, California, September, 1927, in seeds of *Prosopis pubescens.*

NOVEMBER 4, 1927

The 262nd meeting of the Hawaiian Entomological Society convened at 2:30 p. m. at the Experiment Station, H. S. P. A., by President Van Zwaluwenburg. Other members attending were: Messrs. Bryan, Ehrhorn, Fullaway, Giffard, Illingworth, Kemble, Mason, Pemberton, Rosa, Swezey, Willard, and Williams. Dr. Thomas E. Snyder of the Bureau of Entomology, Washington D. C., was a visitor.

The minutes of the 261st meeting were read and approved.

The following report of the Executive Committee was read by the secretary and approved by the Society:

"The Executive Committee desires to report that at the request of Mr. W. M. Giffard, and in conformity with paragraph 4, page 60 of the Introduction to his paper entitled a 'Review of the Hawaiian Cixidae with Descriptions of Species' (Homoptera) published in Proc. Haw. Ent. Soc., VI, No. 1, Aug., 1925, it has been decided with the consent of those concerned to place in the permanent custody of the Bishop Museum for study and reference, the types, paratypes and all other specimens included in the descriptions in said paper. The understanding being that the collection as a whole shall remain intact and as arranged by the author but otherwise subject to the control of said Bishop Museum."

The following resolution was presented by Mr. Bryan and unanimously adopted by those present:

The most difficult and time consuming job in connection with the Hawaiian Entomological Society is that of Editor. For a number of years this Society has been very fortunate in having a most efficient and conscientious Editor. In recognition of this continued service to the Society and to science, Be it resolved

that the sincere thanks of the Society be extended to Mr. O. H. Swezey, Editor.

The secretary read a notice from a Washington, D. C., paper calling attention to the resignation of Dr. L. O. Howard as Chief of the Bureau of Entomology, and the appointment of Dr. C. L. Marlatt in his place. The notice called attention to the fact that Dr. Howard had been Chief of the Bureau for more than 38 years, and in the employ of the Department for 50 years. Also that Dr. Howard would remain in the Bureau and devote his full energies to the field of entomological research.

Mr. Bryan turned over to the Society the Index to Vol. VI of the Proceedings, which he had prepared. Upon motion by Mr. Ehrhorn, a unanimous vote of thanks was extended to Mr. Bryan for his work in preparing this index.

Dr. Snyder gave a very interesting talk regarding the work of the U. S. Bureau of Entomology with termites, giving special emphasis to the work of the Bureau in having building codes modified in all termite infested areas of the United States, to protect buildings from termite attack. He stated that he had met with unexpected success in this work in the Pacific coast states and that one of the main objects of his visit to Hawaii was to help work out a satisfactory modification of the building code in Honolulu that would meet the termite situation as it exists here.

PAPERS

"Palm seed Scolytids in Hawaii." (Col.),

BY O. H. SWEZEY

"Lice affecting poultry in Hawaii,"

BY J. F. ILLINGWORTH

"Insects collected in the pineapple growing section on the Island of Lanai, August, 1927,"

BY J. F. ILLINGWORTH

NOTES AND EXHIBITIONS

Acrapex exanimis (Meyr.).—Mr. Swezey reported having sent specimens of the moth which he had reared from *Panicum torri-*

dum, collected at Koko Head Feb. 22, 1927, and which he had previously considered a new immigrant near to *Sesamia inferens,* to Mr. E. Meyrick, who had identified them as *Caradrina exanimis,* described by him in the Fauna Hawaiiensis, from a single female collected in Kona, Hawaii. Two specimens sent had been compared with the type at the British Museum by Mr. Tams. There it had been placed by Hampson in the genus *Acrapex* which is near related to *Sesamia.* It is the first time that this moth has been collected since the original specimen collected by Dr. Perkins in Kona, Hawaii, in 1892. It is possible that it may be attached to the native grass (*Panicum torridum*) from which it has now been reared.

Curinus coeruleus Muls.—Mr. Swezey exhibited a specimen of this ladybeetle taken on leaf of coconut palm at Pier 12, Honolulu, November 2, 1927. The leaf was badly infested with *Chrysomphalus aonidum,* on which the ladybeetle probably had fed. This indicates that it is capable of maintaining its existence even though the mealybug, *Pseudococus nipae,* for which it was introduced, has entirely disappeared.

Celerio perkinsi Sw.—Mr. Swezey reported that a specimen of this rare sphingid was captured by Mr. Maneke on the Kahana Trail, Sept. 4, 1927.

Bactra truculenta Meyr.—Mr. Van Zwaluwenburg reported that Mr. Pemberton and he found the larvae of this moth-borer of nutgrass (*Cyperus rotundus*) very abundant at several points in the vicinity of Waialua, on Oct. 10. Three days later in scouting along the government road around the island he found the work of the larvae at: (1) the Waialee Boys' Industrial School; (2) about 3.5 miles west of Kahuku post-office; (3) half a mile south of Laie; and (4) about half a mile north of the old sugar mill at Kualoa. At the Boys' School and Kualoa the moth was fairly numerous, especially at the latter point where both larvae and pupae were found. No trace of this insect could be found in the immediate vicinity of Kahuku. This brief survey indicates that the moth is now generally spread over the island of Oahu since its introduction from the Philippines and release in 1925.

Old Photographs of Prominent Entomologists.—Mr. Giffard

exhibited a number of photographs of prominent entomologists which had been presented to him from the effects of the late Albert Koebele. These photographs were of very great interest to the Society and included pictures of Dr. L. O. Howard, showing him as he appeared about the time of his graduation from college, William H. Ashmead, C. V. Riley, W. M. Maskell, W. W. Froggatt, Henry Tryon, and others. Mr. Giffard suggested that a collection of photographs of the early members of the Hawaiian Entomological Society should be made. It was the opinion of those present that such a collection would be of much interest and very valuable. Mr. Giffard was requested to get as complete a collection of these photographs as possible.

Lactrodectes mactans.—Mr. Willard exhibited a specimen of this poisonous spider, and a centipede 5½ inches long upon which the spider was feeding when captured at 213 Kaiulani Ave., Waikiki, Nov. 3, 1927. The spider had spun an irregular and loosely woven web beneath an automobile standing in a garage. The meshes of the web were one inch or more across. It is probable that the centipede had fallen from the automobile into the web and become sufficiently entangled to enable the spider to capture it. When first observed, the centipede was hanging free from the floor at the end of a strong silken cord attached to its head, with its legs securely bound down by numerous silken threads. The fact that a spider of this size was able to capture and kill a centipede 5½ inches long for food is unusual.

Trimicra lateralis Grims.—Dr. Williams exhibited two specimens of a limnobiid fly taken on his lanai in Manoa valley, Honolulu, Oct., 1927. It was later identified by Swezey and Williams as *Trimicra lateralis* Grims. which is represented in the Fauna Hawaiiensis by only two specimens, taken over thirty years ago at two widely separated localities on the island of Hawaii.

The insect is comparatively large and sturdy as far as Hawaiian limnobiids go and is peculiar for its erect-hairy legs.

Latrodectes mactans. (Hour-glass Spider).—Dr. Illingworth collected this poisonous spider in the pineapple fields on the island of Lanai. It is usually found in dark corners about outbuildings. Specimens were taken in the fertilizer shed, in water boxes at

the tanks, and in old pineapple stumps among the dried leaves. This latter situation seems rather peculiar for these spiders. Yet Dr. Illingworth previously reported them in old pineapple plants at Waianae, and he collected them from behind the dried leaves of sugar cane in Queensland.

Family Agromyzidae, Milichiella spp.—Dr. Illingworth exhibited two species of flies which probably belong to this genus. These flies are shiny black with light colored wings, similar to *Milichiella lacteipennis* (Loew). One species collected feeding on ripe pineapple on the island of Lanai, has conspicuous white halteres and a narrow white band on the dorsum of the abdomen. The other has been previously reported by Swezey, numerous about a compost heap at the H. S. P. A. Experiment Station. Dr. Illingworth found swarms of these flies at the greenhouses at the University of Hawaii. They probably came from the refuse heap nearby, where all sorts of rubbish is dumped. The females have a broad abdomen, conspicuously silver white above. The bodies of the males are pure black.

DECEMBER 1, 1927

The annual meeting, making the 263rd regular meeting of the Hawaiian Entomological Society, was called to order at 2:30 p. m. at the H. S. P. A. Experiment Station by President Van Zwaluwenburg. Other members present were: Messrs. Bryan, Ehrhorn, Fullaway, Giffard, Hadden, Illingworth, Mason, Pemberton, Rosa, Swezey, Willard, and Williams. Mr. E. P. Mumford was a visitor.

The minutes of the 262nd meeting were read and approved as corrected.

The treasurer read his report for the year, December 2, 1926, to December 1, 1927, showing receipts of $269.65, and expenditure of $20.37, leaving a balance on hand of $249.28. This report was approved and Mr. D. T. Fullaway was appointed by the president to audit the treasurer's accounts.

The secretary read a letter from Mr. J. K. Butler, secretary of

the Hawaiian Sugar Planters' Association, notifying the society that his association had approved the payment of a bill in the amount of $658.88, which covered the cost of printing the Proceedings of the Hawaiian Entomological Society for 1926. Upon motion by Mr. Giffard it was voted that the secretary write a letter of thanks to the Hawaiian Sugar Planters' Association for their continued generous financial assistance.

Upon motion by Mr. Bryan, seconded by Mr. Ehrhorn, Mr. E. P. Mumford was nominated for active membership in the society.

Mr. Giffard reported that he was making good progress in collecting photographs of early members of the Hawaiian Entomological Society.

The following officers were elected for 1928:

President—E. H. Bryan, Jr.
Vice-President—O. H. Swezey.
Secretary-Treasurer—H. F. Willard.
Executive Committee—W. M. Giffard. F. X. Williams.

PRESIDENTIAL ADDRESS

***"The Interrelationships of Insects and Round Worms,"**

BY R. H. VAN ZWALUWENBURG.

PAPERS

"Some new Species of Lepidopterous Leafminers in Hawaii."

BY O. H. SWEZEY.

Mr. Swezey presented also the following papers:

"New Species of Hawaiian Lepidoptera,"

BY EDWARD MEYRICK, MARLBOROUGH, ENGLAND.

"X-rays on Termites,"

BY D. L. CRAWFORD.

"Bees of the Genus Perdita in the J. C. Bridwell Collection,"

BY P. H. TIMBERLAKE, RIVERSIDE, CALIF.

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*Published as Bulletin of the Experiment Station, H. S. P. A., Ent. Series, No. 20, January, 1928.

Notes on Proterhinus (Coleoptera)

BY DR. R. C. L. PERKINS.

NOTES AND EXHIBITIONS

Hister bimaculatus L.—Dr. Illingworth found this histerid abundant in refuse from the pineapple canneries on Maui, Nov. 10, 1927. It evidently was doing much to check the hordes of maggots, nitidulids, and other pests, that normally breed in such waste material.

Longan insects.—Mr. Fullaway exhibited secimens of a scolytid beetle and a pyralid moth reared from seeds of the Longan (*Nephelium longanum*) taken out of fruit gathered on the tree. The moth is *Dichocrocis punctiferalis* (Guen.) a common species in the Oriental region. It was taken once in quarantine at Honolulu, the immature stages infesting a five-leaved pine on an Oriental steamer. In the longan the worm is a borer; after feeding extensively in the pulp it enters the seed and pupates in the cavity which it excavates. The beetle is an unidentified species developing in large numbers within infested seeds. The infestation occurs at the stem-bud.

A New Psyllid From Maui

BY D. L. CRAWFORD

(Presented at the meeting of May 5, 1927)

Hevaheva swezeyi n. sp.

A distinct species of this interesting genus has been found by Mr. O. H. Swezey of the Experiment Station, H. S. P. A. It is like *H. silvestris* Kirk. and *H. monticola* Kirk. in having the forewings partly colored, but the color pattern is very different from both of these, resembling the latter more closely than the other and possibly derived from *H. monticola.*

Size of body, both male and female, very small, less than 1mm. in length, with forewings about 1.4mm. in length. Color of body brown, with head and prothorax usually darker and often a dark spot on mesonotum; thorax and venter clothed with relatively long sparsely scattered hairs, as characteristic of the genus.

Antennae very short, about as long as width of head between eyes. Forewings about three times as long as broad, transparent except on the brown areas; veins slender, with a row of conspicuous setae; membrane clear except the apical one-fifth brown and brown macula on basal cubital vein at tip of claval suture. Some males appear to have clear wings, but this may be due to lack of full development before specimens were killed.

Described from 28 specimens taken at Olinda, Maui, Feb. 10, 1927, on leaves of Pelea, by O. H. Swezey.

The nymphs adhere closely to the Pelea leaves, resembling small Coccidae superficially. They do not form galls.

Psyllidae of Fiji and Samoa

BY D. L. CRAWFORD, UNIVERSITY OF HAWAII.

(Presented at the meeting of March 3, 1927)

A collection of Psyllidae (Chermidae) from Fiji and Samoa was submitted to me recently for study, by the Bishop Museum. Some of these specimens were collected by E. H. Bryan, Jr., and the remainder by O. H. Swezey and G. P. Wilder.

Another Samoan collection was submitted by P. A. Buxton, of the London School of Hygiene and Tropical Medicine, containing some of the same species and some others in addition, including

several new species. These latter are described in a paper to be published elsewhere and are as follows:

Paurocephala wilderi n. sp.

Tyora buxtoni n. sp.

Megatrioza swezeyi n. sp.

Trioza samoensis n. sp.

The species represented in the Bishop Museum collection are as follows:

Tyora buxtoni Crawford

One specimen of this recently described species was taken by Swezey and Wilder at Tutuila, Samoa, on the Afono trail, September 25, 1923. This species was described in a paper submitted to Dr. P. A. Buxton for publication, based on several specimens collected by him in Samoa. It is closely related to Walker's old *Tyora congrua,* but very distinct, nevertheless.

Mesohomotoma camphorae Kuwayama

(Trans. Sapporo Nat. Hist. Soc. vol. 2, p. 181, 1908.)

A large number of specimens collected in the Lau group of Fiji, on the islands of Namuka, Oneata, Mothe, and at Colo-i-Suva, on Veti Levu by E. H. Bryan, and two specimens taken by Swezey and Wilder on Samoa are assigned to this species, which was first based on Formosan specimens but appears to be widely distributed in the Pacific. The specimens agree closely with Kuwayama's description of the species, but the food plant is very different, being the milo tree, *Thespesia populnea,* while the Formosan specimens were reported on camphor trees. The milo is more closely related to Hibiscus, which would suggest a possible identity of these insects with Froggatt's species, *M. hibisci,* of Australia, which, however, is not the case, if we may judge from Froggatt's description and illustrations (Proc. Linn. Soc. New South Wales, vol. 2, p. 287, 1901.) The Australian species is apparently very closely related, but seems to be different in a few minor characteristics.

Megatrioza asiatica Crawford

(Philippine Journal of Science, vol. 15, p. 197, 1919.)

One specimen from Tutuila, Samoa, taken by Swezey and Wilder, September 6, 1923.

Megatrioza vitiensis (Kirkaldy)

(Proc. Hawaiian Ent. Soc., vol. 1, p. 103, 1907.)

(Crawford, Philippine Journal Science, vol. 15, p. 195, 1919.)

This species, described many years ago by Kirkaldy, has appeared lately in several collections from Pacific Islands. Many specimens were taken by Swezey and Wilder at Tutuila, Samoa, September 7, 1923, on *Eugenia malaccensis,* the usual food plant of the species. It is known to occur also in Fiji (its type locality), Amboina, Pemalonga, Singapore, and Ceylon, usually on *Eugenia malaccensis.* The species is apparently widely distributed.

Megatrioza swezeyi Crawford

This species is close to *M. vitiensis* (Kirkaldy) and is represented by two specimens from Samoa (Tutuila and Upolu), and one from Lau, Fiji (Yuvutha island).

Megatrioza bryani n. sp.

This species is very close to *M. asiatica* Crawford, but differs sharply in wing venation, the radial sector being very long and extending nearly to the tip of the wing, while in *M. asiatica* this vein is very short. The new species lacks the conspicuous black spot at base of forewing, characteristic of the older species.

The body is shining black, with long, sparse pubescence on thoracic dorsum. The genitalia of the two species are similar.

Fiji, six specimens taken on Aiwa island, Lau, Fiji, August 31, 1924, by E. H. Bryan, Jr.

Trioza samoensis Crawford

Several specimens of this species were taken by Swezey and Wilder at Pago Pago, Tutuila, Samoa, September 30, 1923.

X-Rays On Termites

BY D. L. CRAWFORD.

(Presented at the meeting of December 1, 1927)

It is often as important to record experiments which yield negative results as to report those which are successful. For this reason, I report briefly some tests made to ascertain the effect of X-rays on termites. As a means of killing termites in houses and furniture the X-ray, if effective, would be nearly ideal because of the ease of application. That it does not appear to be effective, however, is the conclusion presented herein.

Two tests were made of this recently, one at the physics laboratory of the local university with a machine of comparatively low power and the other at a private laboratory in Honolulu with a machine of much greater power. The maximum used was 30 kilovolts.

Procedure: A number of termites (*Kalotermes immigrans* Snyder) were placed in small pill boxes and subjected to various strengths of X-rays for varying periods of time, from 5 to 30 minutes. After this treatment they were kept under observation to ascertain the effects. Immediately after treatment the termites appeared to be quite unaffected by the rays and for many days afterward there seemed to be no visible effects of the treatment. The termites were provided with a bit of wood for food and they continued to feed actively during all the period of observation.

Biological Notes on Scolopendrellidae, Destructive to the Roots of Pineapple in Hawaii

BY J. F. ILLINGWORTH.

(Presented at the meeting of May 5, 1927)

Until recently little was known of the life history and habits of these primitive insects. All of the earlier writers dealt only with their systematic and morphological aspects. When I discovered these tiny creatures eating pineapple roots, I reviewed the literature and found that they were also an important pest in California, Oregon and Utah,* where they attack truck crops. Hence several writers over there have made a study of life history and control measures. It is principally the early stages that I wish to deal with in this paper, adding some notes upon feeding habits and natural enemies.

While studying the root system of pineapple plants in root cages, I have had an excellent opportunity to observe the activities of a great number of tiny creatures that inhabit the soil under such conditions. The Scolopendrellidae are always present. They are large enough to be quite easily seen with the naked eye, since they are two or three millimeters in length. Their white color, too, makes them all the more noticeable, as they appear among the dark particles of the soil. They resemble minute centipedes, but may be easily distinguished from these creatures by the cerci, which terminate the body. The adults have twelve pairs of legs; the front pair very small. Differing again from the centipedes, the young have less legs than do adults. Immature individuals with nine, ten, and eleven pairs of legs were observed by the earlier writers. Some concluding that at the beginning there might be as few as three pairs, drawing the analogy from the millipedes. Packard** says that "It is most probable that the young is hexapodous, since the first pair of limbs are 4-jointed, all the rest

*1924—F. H. Wymore. "Biology and Control of the Garden Centipede." Pomona College Journ. Ent. and Zool., Vol. 16, pp. 73-88 (Good Bibliography).

**1898—A. S. Packard. A Text-book of Entomology, Symphyla pp. 18-25.

5-jointed." Williams † was the first to observe that the newly-hatched larva had seven pairs of legs. He says, "It is, therefore, a highly specialized young rather than a generalized, ancestral form such as the hexapod larva of other Diplopods. . . ."

In my own experience, I frequently found very small specimens among the roots with eight pairs of legs, and, again, several together in a soil cavity, six inches deep, with only seven pairs. These latter apparently were newly-hatched, for the mother was with them. Yet I could find no trace of the egg shells. The female was considerably disturbed during the observations, and this may have caused her to act abnormally. She seized one of the young by the head and devoured it before deserting them. This, I have observed, is a common practice with true centipedes, eating either the eggs or newly-hatched young when excited.

At another time, I was fortunate in finding a nest of eggs of the symphylids, placed in a cavity against the glass. These were in a splendid position for observation, and the mother was carefully guarding them. The female had gone to a depth of fourteen inches in the soil, to oviposit where the supply of moisture was rather constant. There she had formed a cavity about one-fourth inch in diameter. The eight eggs of the set were closely packed

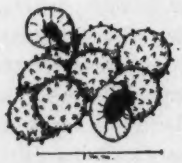

Fig. 1. Sketch of egg cluster, showing young escaping from egg shell, x 25.

together inside. The day following the discovery of the nest, I saw that the eggs were hatching. At that time they were sketched and several photographs made to show the character of the eggs and young accompanied by the guarding mother.

The eggs, as shown in the sketch are perfectly spherical in out-

† 1907—S. R. Williams. "Habits and Structure of *Scutigerella immaculata* (Newport)." Proc. Boston Soc. Nat. Hist., Vol. 33, pp. 461-85, pl. 36-38.

line, with rather regularly projecting points. These give the surface of the shell a roughened appearance. When hatching, the shell is ruptured on one side, the larva backing out, so-to-speak, as shown in the sketch. At first no legs or other appendages are visible, and the larva looks very worm-like, with scarcely any motion. Soon, however, the legs begin to unfold, and it is seen that they tightly clasp over the antennae, which lie down along the median ventral line. These latter organs, at this stage, are comparatively short, each being made up of six bead-like segments. The antennae increase in length and number of segments with each moult.

Once out of the eggs, the young appear to be very gregarious, the mother watching over them like a hen with a brood of chicks. The only thing that I saw the tiny creatures eat was the empty egg shells—these disappeared the first day.

Fig. 2. Mother in soil guarding eggs, x 7.
Fig. 3. Mother in soil with hatching eggs and young, x 10.

Subsequently, I found three other sets of eggs, each deep in the soil as before, and eight in number. They were in good position, against the glass of the root cage, hence I was able to follow their development. A typical case: June 28th—I saw a female symphylid, deep in the soil, forming a nesting cavity.

June 29th—She had laid eight eggs and was guarding them. I made daily observations until:

July 4th—Eight young had hatched during the night. Hence the incubation period was about five days.

July 6th—The young moulted, and I counted eight pairs of legs, while the antennae had increased to twelve segments. The larvae were now very active, nervously waving their antennae about, as is the habit of adults. The mother remained, hovering over them, apparently eating nothing. However, the next morning, I found that they had all left the cavity,—scattering into the soil, so I was unable to follow their development further.

FEEDING HABITS OF THE ADULTS.

These centipede-like creatures do a vast amount of damage to the underground portion of the pineapple plant. In our fields where paper mulch is used, we have ideal conditions for the rapid multiplication of such delicate creatures. In nature they thrive under stones, logs, etc., where they are not subjected to sudden changes in moisture and temperature. In attacking the roots, they eat out the growing tips, and in this way open them up to the inroads of various organisms of disease, such as fungi, bacteria, etc. In one of our root cages, containing a pure colony of these depredators, not a single plant will establish itself. As fast as the new roots start out they are eaten back. Only the short stumps are there to tell the story, and these soon succumb to rots. Unfortunately, field observations show that this pest is widely distributed in our pineapple-growing districts.

The outlook for the artificial control of such a pest would look rather hopeless. But, fortunately nature has come to our assistance with valuable predators. I find constantly, at least two sorts of beetles, both the larvae and adults of which prey upon the symphylids. One of these is the staphylinid, *Philonthus discoideus* (Gravenhorst) and the other is our good cucujid, *Cryptamorpha desjardinsi* (Guer.). These are like miniature tigers, running about freely among the soil particles. When they come upon their prey the battle is furious for a few moments, the beetle larva holding the symphylid by the middle of the back in a bulldog grip. As soon as the struggling ceases, the remains are eaten on the spot.

I was greatly interested, on one occasion, when trying to breed out the staphylinid beetle larva for determination, to find that the symphylids retaliated by eating holes into the beetle's thorax after he had assumed the quiescent pupal stage. Further investigations all indicate that though the symphylids are omnivorous feeders, they are weak creatures and poor fighters—hence feed principally upon tender plant tissue. They appear to favor mostly the tender tips of living roots.

Lice Affecting Poultry in Hawaii

BY J. F. ILLINGWORTH.

(Presented at the meeting of November 4, 1927)

I wish to record a number of cosmopolitan species of lice taken from poultry in the vicinity of Honolulu during 1926. This collection was made by Dr. Marie Faus, who was working with me on an investigation of pests of man and domestic animals.

As far as I know, only one of the nine species of Mallophaga that we found has been recorded as occurring in Hawaii.

The common hen louse, *Menopon gallinae* (Linn.) (= *M. pallidum* Nitzsch *), a general parasite infesting poultry. Specimens were taken: ex turkey, Honolulu, Nov. 23, 1926; ex Guinea hen, Honolulu, Dec. 9, 1926; ex chicken, Waipio, Dec. 14, 1926; and ex chicken, Honolulu, Dec. 16, 1926.

The body louse of the hen, *Menopon stamineum* Nitzsch (= *M. biseriatum* Paiget *), which also has a wide range of hosts. It occurs on chickens, turkeys, pigeons, and peacocks. Our specimens are from chickens, Honolulu, November 23 and Dec. 16, 1926.

The common louse of peafowl and Guinea hen, *Menopon phaeastomum* Nitzsch. This species was taken from Guinea hen in Honolulu, Dec. 9, 1926, and from pea fowl on the same date.

The large turkey louse, *Goniodes stilifer* Nitzsch, was taken on chickens at Waipio, Dec. 19, 1926. This species has been previously recorded in Hawaii by Van Dine (Hawaii Agric. Exp. Sta-

tion Annual Report, 1908, p. 36), and Swezey (Proc. Hawaiian Ent. Soc., vol. 5, p. 37, 1922).

The lesser chicken louse, *Goniocotes hologaster* Nitzsch, taken on both chickens and turkeys in Honolulu markets during November and December, 1926.

The large chicken louse, *Goniocotes gigas* Tasch., was taken on chickens at Waipio, December 14, 1926.

The slender louse of the turkey, *Lipeurus gallipavonis* Geoffroy (= *L. polytrapezius* Nitzsch *), was taken on turkeys in Honolulu market, December 16, 1926.

The large Lipeurus of the hen, *Lipeurus heterographus* Nitzsch, was collected on chickens in Honolulu, November 23, 1926.

The variable hen louse, *Lipeurus caponis* (Linn.) (= *L. variabilis* Nitzsch), was taken on chickens in Honolulu, Dec. 16, 1926.

All of these species are illustrated by Professor Glenn W. Herrick, in his work on "Some external parasites of poultry," Cornell Agric. Exper. Station, Bull. 359, 1915.

The synonomy marked with a (*) is from Essig, Insects of Western North America, pages 126-138, 1926.

Insects Collected in the Pineapple Growing Section on the Island of Lanai, August, 1927

BY J. F. ILLINGWORTH.

(Presented at the meeting of November 4, 1927)

During three days in the vicinity of Lanai City I made as complete a collection of the insects as possible. I wish to present them here for record.

Class CRUSTACEA.
Family Oniscidae.
Porcellio laevis Latr. (sow bug or damp bug).
Armadillo hawaiiensis Dana (Spherillo) (pill bug).

Class ARACHNIDA.
Family Theridiidae.
Latrodectes mactans (hour-glass spider).

Class CHILOPODA (centipedes).
Family Geophilidae.
Mecistocephalus maxillaris (Gervais).

CLASS SYMPHYLA.

Family Scolopendrellidae.
Scutigerella immaculata (Newport).

Class HEXAPODA (insects).

Family Labiduridae.
Labidura riparia (Pallas) and *Euborellia annulipes* (Lucas).

Family Blattidae (cockroaches). I have never seen as many cockroaches anywhere else in Hawaii. Eight species are common in the pineapple area. Most of these congregate in the fields, especially under mulching paper. They, apparently, have multiplied without limit in the old cactus beds. I was interested to see the great flocks of Minah following the tractors in cactus destruction. The birds kept as close as possible to the big chain, which turned over the stumps, and pounced upon the hordes of cockroaches thus uncovered. The species collected are:

Allacta similis (Sauss.).
Blattella germanica (Linn.) (German roach).
Cutilia soror (Brunn.).
Periplaneta americana (Linn.) (American roach).
Periplaneta australasiae (Fab.) (Australian roach).
Leucophaea maderae (Fab.) Madeira roach.
Pycnoscelus surinamensis (Linn.) (Burrowing roach).
Diploptera dytiscoides (Serv.) (Cypress roach).

Family Gryllidae.
Gryllodes sigillatus (Walk.).
Gryllus oceanicus LeG.

Family Libellulidae (dragon-flies).
Pantala flavescens Fab.

Family Pediculidae.
Haematopinus suis (Linn.) (hog louse).

Family Reduviidae.
Zelus renardii Kolenati (assassin bug).
Nysius delectus White.

Family Asiracidae.
Peregrinus maidis (Ashm.)
Perkinsiella saccharicida Kirk.

Family Coccidae.
Pseudococcus brevipes (Cockerell) (pineapple mealy bug).
Diaspis bromeliae (Kerner) (pineapple scale).

Family Hydrophilidae.
Dactylosternum abdominale (Fab.)

Family Elateridae (click beetles).
Monocrepidius exsul Sharp.

Family Nitidulidae.
Carpophilus humeralis (Fab.) (pineapple beetle).
Carpophilus maculatus Murray.

Family Colydiidae.
Colobicus parilis Pasc.

Family Cucujidae.
Cryptamorpha desjardinsi (Guer.)

Family Coccinellidae.
Rhizobius ventralis (Erich.) (Preys on mealy bugs).
Coelophora inequalis (Fab.) (Feeds on plant lice).

Family Scarabaeidae.
Adoretus sinicus Burmeister (rose beetle).
Pleurophorus parvulus Chev.
Aphodius lividus Oliver.

Family Tenebrionidae (ground beetles).
Gonocephalum seriatum Boisduval.
Epitragus diremptus Karsch.
Alphitobius lateralis (Boheman).
Blapstinus dilatatus Leconte.

Family Anthribidae.
Araecerus fasciculatus (DeG.)

Family Curculionidae.
Pantomorus godmani (Crotch) (Olinda bug).

Family Lycaenidae.
Lycaena boetica (Linn.).

Family Pieridae.
Pontia rapae (Linn.) (cabbage butterfly).

Family Pyraustidae.
Hymenia recurvalis (Fab.) (beet web worm).

Family Sphingidae.
Celerio lineata (Fab.) (white-lined sphinx).

Family Caradrinidae.
Cirphis unipuncta Haw. (cutworm).

Family Tineidae.
Pyroderces rileyi (Walsingham) (budmoth).
Ereunetis flavistriata Walsingham.
Petrochroa dimorpha Busck.

Family Chironomidae.
Apelma brevis Johannsen.

Family Stratiomyidae.
Neoexaireta spinigera (Wied.) (soldier fly).

Family Dolichopodidae.
Psilopus patellifer Thomson (long-legged flies).

Family Syrphidae.
Volucella obesa (Fab.)
Eristalis punctulatus Macq.

Family Muscidae.
Musca vicina Macq. (oriental house-fly).
Stomoxys calcitrans (Linn.) (stable fly).
Haematobia irritans (Linn.) (horn fly).

Family Sarcophagidae (flesh flies).
Sarcophaga barbata Thomson.
Sarcophaga fuscicauda Böttcher.
Sarcophaga dux Thomson.
Sarcophaga pallinervis Thomson.

Family Tachinidae (parasitic flies).
Archytas cirphis Curran.
Chaetogaedia monticola (Bigot).

Family Calliphoridae (blow flies).
Lucilia sericata Meign. (British sheep maggot fly).
Chrysomyia megacephala (Fab.) (oriental sheep maggot fly).
Chrysomyia albiceps Wied. (Australian sheep maggot fly).

Family Anthomyidae.
Atherigona excisa Wied.
Hylemyia cilicrura Rondani.
Ophyra nigra Wied.
Fannia pusio Wied.

Family Ortalidae.
Euxesta annonae (Fab.)
Notogramma stigma (Fab.)

Family Drosophilidae.
Drosophila repleta Woll.

Family Trypetidae.
Dacus cucurbitae Coquillett. (melon fly).

Family Agromyzidae.
Milichiela lacteipennis (Loew)

Family Borboridae.
Limosina venalicia (Osten-Sacken).

Family Chalcididae.
Chalcis obscurata Walk.
Stomatoceras pertorvum Girault.

Family Braconidae.
Chelonus blackburni Cameron.

Family Ichneumonidae.
Cremastus hymeniae Vier.

Family Evaniidae.
Evania sericea Cameron.

Family Formicidae. (ants).
Pheidole megacephala (Fab.) (Pheidole ant.)
Cardiocondyla nuda Mayr. var. *minutior* Forel.
Tapinoma melanocephalum (Fab.)
Prenolepis sp.

Family Psammocharidae.
Psammochares luctuosus (Cresson).

Family Scoliidae.
Scolia manilae Ashmead (Adoretus parasite).

Family Vespidae.
Polistes macaensis (Fab.)
Polistes aurifer Sauss.

Family Eumenidae.
Pachodynerus simplicicornis (Sauss.)
Odynerus rubritinctus Sm. (Det. Swezey).
Odynerus insulicola Blkb (Det. Swezey).
Odynerus nautarum Sauss. (Det. Swezey).

Family Crabronidae.
Xenocrabro mandibularis (Sm.).

Family Prosopidae.
Nesoprosopis laeta Perk. (wild bee.)

Family Andrenidae.
Xylocopa varipuncta Patton (carpenter bee).

Family Apidae.
Apis mellifica Linn. (honey bee).

Two New Brenthidae in the Bishop Museum Collection

BY R. KLEINE, STETTIN, GERMANY.

(Translated from the German by E. H. Bryan, Jr., and presented at the meeting of January 6, 1927.)

I have examined a collection of Brenthidae from the Bernice P. Bishop Museum, Honolulu, assembled and sent to me by E. H. Bryan, Jr. Some of these specimens are from various parts of Polynesia and Melanesia and help to clear up the tangled zoogeographical relations in these scattered archipelagoes. No Brenthidae have so far been reported from Hawaii, and my hopes have been disappointed that I would find some among the material from the Bishop Museum. It seems as if no Brenthidae occur there.

The finding of Brenthidae in Hawaii would clear up a very important faunistic question. My lengthy studies lead me to recognize two great centers of development: tropical Africa, and the Papuan region, with New Guinea as the nucleus. The Papuan forms have in part shifted to the northwest, but have not made a very great migration. They have spread more to the west: to Madagascar and the neotropical region, being absent only in Africa itself. The distribution from the African center is more important. These forms have gone east as well as west, and are known to have reached as far as Tahiti. The newly established Samoan species likewise has similar affinities. A second migration has moved from Madagascar to South America, as the common species of that region prove. The Nemocephalini and Brenthini of South America have developed from the Pseudoceocephalini of Africa and Madagascar. We must regard these highly developed Brenthidae as derived in this way. And now it is important that in the Marquesas islands one typical Brenthus is established, but nothing derived from the African center. The finding of similar neotropical Brenthidae in Hawaii would fix the limit of the great wave of migration.

Geologically the Marquesas Islands do not belong to Melanesia.

Samoa must lie about on the border of Melanesia, as is demonstrated by the Brenthid discoveries. The submergence between the groups of islands is very profound, and it will have to be supposed that at the time of their colonization, the present islands stood as much greater continental masses, with a deep sea separating the Marquesas Islands from Melanesia.

Perhaps an intensive search in Hawaii might yet disclose some Brenthidae.

Cyphagogus fijianus n. sp.

Black, bloodred on the 1st, 2nd, and a part of the 3rd ridges; the red part is broadest at the base, posteriorly it narrows, and ends at the suture. The cone of the prothorax is redbrown at the neck; legs redbrown to dark brown; the entire body shining, the ventral surface more so than the dorsal surface. Head parallel, flat, posterior margin straight. Meta- and mesorostrum only a little smaller than the head; prorostrum slightly broadened, anterior margin faintly sinuated on the inside; punctations generally slight, delicate, scattered; the underside of the head with long, narrow gular furrows; mesorostrum with two long furrows; prorostrum with two distinct hairs. Antennal segments conical, the 3rd and 4th somewhat quadrate, 5th to 8th broader than long, 9th to 11th considerably enlarged, 9th and 10th resembling the 8th in shape; all the segments from the 8th on, very loosely connected; 1st to 8th segments separated (distinct) with long hair; from the 9th on, pitted and with short pubescence. Cone of the prothorax broad and flat, the prothorax of the usual form, with the exception of the separated anterior part, the loculose punctation, and the long haired punctures. The 2nd ridge of the elytra narrowed posteriorly, the 3rd to 6th sharp edged, as broad as the furrow, the following surface broader than the furrow; from the 3rd on, all the ridges separate, strongly punctate and with long hair. Fore and middle legs normal; the petiole of the hind femora grooved on the inner side, the transition scarcely narrowed from the club to the middle of the stoutness, hairy on the petiole, base of the club stout, long, distinct, the middle of the club without sculptures, the apex (knee) with punctate sculptures and with short hair. Tibia extremely robust, concave on the inner side, shagreened and soft, with long hair. Metatarsus very robust, as long as the second and third tarsal segments combined. Claw segment cylindrical. Metasternum and abdomen with scattered punctures.

Length: 6-8 mm.; breadth of prothorax, about 1 mm.

Fiji: Viti Levu, Colo-i-Suva, June 28-30, 1924 (E. H. Bryan, Jr.).

Type in the Bernice P. Bishop Museum.

This new species is the fortieth of the genus. It is easily distinguished from all the other species by the nature and manner of its coloration: there are no other Cyphagogus which show

longitudinal markings, all have cross bands. The bands are united higher on the sides.

C. fijianus is the first species occurring outside the Australian continent. The sphere of dissemination for the genus has been from Ceylon to the islands east of the continent of Australia. Inasmuch as the relations are scanty, the general type of the

1 2

Fig. 1. *Cyphagogus fijianus*, color pattern on elytron.
Fig. 2. *Baryrrhynchus setosellus*, color pattern on elytron.
(The dark shaded parts are light.)

species of the Australian continent is the colored as well as any other. Probably the support is greater in New Guinea. The dark colored type prevails there, bright or mottled species being secondary. As soon as discoveries are made in the Solomon Islands, the faunistic relations will become clearer.

Baryrrhynchus setosellus n. sp.

Male: Violet brown, prothorax sometimes redbrown, the entire body very shining. Head transverse, without furrows, single coarse punctures, the latter with hairs; hind margin nearly straight; eyes projecting; ventral surface, in front of the gular pits (or furrows) with lateral triangular depressions (cavities). Metarostrum semicircular, excavated, the hollows with wrinkled sculpture; the sides with single punctures and hairy. Antennal processes developed, in the middle with scattered, coarse punctures. Prorostrum with coarse, wrinkled sculpture. Mandibles separate, obtusely toothed. The ventral side of the prorostrum keeled. 3rd antennal segment conical, 4th and 5th more or less cylindrical, the following cylindrical acute angled, the 9th longer than the 8th or 10th. Prothorax elliptical, without furrows, with fine puncturation and short, close lying hair on the outside. The elytra furrowed like a lattice, with erect hair. Pattern as in figure 2. Legs normal. Metasternum and abdomen strongly furrowed.

Female: differing in the usual manner.

Length: 16-18 mm. Breadth of prothorax, 3 mm.

Solomon Islands: Guadalcanar (J. A. Kusche). 1 male and 3 females.

Type in the Bernice P. Bishop Museum.

Setosellus is related to *indocilis* Fairm., differing from it as follows: The ground color is not red but violet brown; the cavi-

ties of the mesorostrum are wrinkled and not punctured; the mandibles are short and robust, resembling more the Malayan than the Papuan species; the elytra have unusually strong hair. The species shows a strong relationship to the Malayan forms and suggests that the genus has wandered eastward from a western center.

Brenthidae in the Bishop Museum, identified by R. Kleine.

BY E. H. BRYAN, JR.

The following species of Brenthidae in the collections of the Bernice P. Bishop Museum, Honolulu, have been identified by Herr R. Kleine, Stettin, Germany. The new species are described in the foregoing article by R. Kleine.

BRENTHINAE.

CALODROMINI.

Cyphagogus bipunctatus Senna.
1, Booyong, Australia, XI. 1904, (Helms).

Cyphagogus fijianus Kleine (n. sp.).
Type, Colo-i-suva, Viti Levu, Fiji, 28. VI. 1924 (E. H. Bryan, Jr.).

Catagogus desidiosus Kleine.
1, Durimbah, 10. II. 1904 (Helms).

EPHEBOCERINI.

Jonthocerus ophthalmicus Pascoe.
5, Australia (Helms collection).

TRACHELIZINI.

Cerobates australasiae Fairm.
2, Australia (Helms collection).

Cerobates adustus Senna.
2, Larat, Malay, XII. 1907 (F. Muir).
1, Buitenzorg, Java, VI. 1907 (F. Muir).
1, Sigatoka, Fiji, 12. VIII. 1913 (J. F. Illingworth).

Trachelizus bisulcatus (Fab.).
3, Larat, Malay, XII. 1907 (F. Muir).
7, Buitenzorg, Java, VI. 1907 (F. Muir).
1, Amboina, Malay, IV. 1908 (F. Muir).
1, Cairns, N. Queensland, 1920 (Dodd).

Miolispa australiana Senna.
4, Babinda, N. Queensland, 1919-20 (J. F. Illingworth).

Miolispa robusta Kleine.
1, Amboina, Malay, IV. 1908 (F. Muir).

Hypomiolispa compressa Kleine.
1, Amboina, Malay, IV. 1908 (F. Muir).

Microtrachelizus howitti (Pascoe).
1, Bathurst, Australia, X. 1902 (Helms).

Cordus hospes Germ.
2, Sydney, N. S. W., XI. 1902 (Helms).
2, Benalla, Australia (Helms).

ARRHENODINI.

Prophthalmus tricolor Pow.
1, Amboina, IV. 1908 (F. Muir).

Baryrrhynchus setosellus Kleine (n. sp.).
Type, allotype and paratype, Guadalcanar, Solomon Is., XI. 1920 (J. A. Kusche).

Caenorychodes digramma (Boisd.).
2, Babinda, N. Queensland, 1920 (J. F. Illingworth).
2, Cairns, N. Queensland, 1918 (J. F. Illingworth).
1, Cairns, N. Queensland (Helms).

Caenorychodes maassi Kleine.
5, Guadalcanar, Solomon Is., I. 1921 (J. A. Kusche).

BELOPHERINI.

Ectocemus 10-*maculatus* (Montr.).
64, Guadalcanar, Solomon Is., XI. 1920-I. 1921 (J. A. Kusche).
1, Duke of York Is. (Helms).
1, Cairns, N. Queensland (Helms).
1, Cairns, N. Queensland, 1920 (J. F. Illingworth).
1, Babinda, N. Queensland, 1920 (J. F. Illingworth).
1, Mossman, N. Queensland, 1921 (J. F. Illingworth).

ITHYSTERINI.

Lasiorhynchus barbicornis (Fab.).
3, New Zealand (Helms collection).
1, Greymouth, N. Z. (Helms).

Bolbogaster ctenostomoides Lacord.
1 Colo-i-suva, Viti Levu, Fiji, 30. VI. 1924 (E. H. Bryan, Jr.).

Mesetia amoena Blackburn.
2, Clarence River, N. S. W. (Helms).

Ithystenus spinosus Kleine.
24, Larat, XII, 1907 (F. Muir).

Ithystenus hollandiae (Boisduval).
2, Cairns, N. Queensland, 1920 (J. F. Illingworth).
1, Cairns, N. Queensland (Helms).
2, Babinda, N. Queensland, 1919-1920 (J. F. Illingworth).

Ithystenus wallacei Pascoe.
2, Amboina, IV. 1908 (F. Muir).

Ithystenus francoisi Desbr.
8, Guadalcanar, Solomon Is., II. 1921 (J. A. Kusche)

PSEUDOCEPHALINI.

Schizotrachelus dichrous Lacord.
2, Babinda, N. Queensland, 1920 (J. F. Illingworth).
1, Gordonvale, N. Queensland, 1917 (J. F. Illingworth).
2, Clarence River, N. S. W., I. 1904 (Helms).
1, Booyong, Australia, XI. 1904 (Helms).
5, Australia (Helms Collection).

Uropteroides douei (Montrouz.).
1, Honailon, New Caledonia, 28. X. 25, (W. A. Ford).

Hormocerus reticulatus (Lund) (Fab.).
1, Booyong, N. S. W., XI. 1904 (Helms).
1, Queensland, 1904 (Helms).

Eubactrus semiaeneus Lacord.
2, Sigatoka, Viti Levu, Fiji, 12. VIII. 1913 (J. F. Illingworth).
2, Fiji (Muir).
1, Ovalau I., Fiji, 20. X. 1924 (E. H. Bryan, Jr.).
1, Matuku I., Fiji, 6. VII. 1924 (E. H. Bryan, Jr.).
7, Moala I., Fiji, 12. VII. 1924 (E. H. Bryan, Jr.).
8, Tuvutha I., Lau, Fiji, 11. IX. 1924 (E. H. Bryan, Jr.).
1, Munia I., Lau, Fiji, 25. IX. 1924 (E. H. Bryan, Jr.).

Zwei neue Brenthiden aus der Sammlung der Exp. Stat. of the Hawaiian Sugar Planters' Association

BY R. KLEINE, STETTIN, GERMANY

(Presented by O. H. Swezey at the meeting of July 7, 1927.)

Herr O. H. Swezey, Entomologist an der oben genannten Exp. Stat. sandte mir das in der sortigen Sammlung befindliche Brenthidenmaterial zu.

Die Durchsicht ergab, zwei neue Arten, von denen namentlich die *Miolispa* von Fiji insofern interessant und auch wichtig ist, als sie der östlichste Vertreter der grossen and weit verbreiteten Gattung ist. Ausser der Beschreibung der neuen Arten habe ich noch einige Fundorte schon bekannter hinzugefügt, die für die Kenntnis der Verbreitung von Wichtigkeit sind.

Miolispa fijiana n. sp.

Am ganzen Körper erzfarbig, schwarzgrün, metallisch glänzend, Rüssel und Fühler schwarz, Schmuckstreifen auf der 3. Rippe dunkelrot, in der Mitte breit unterbrochen, den Hinterrand der Elytren nicht erreichend.

Kopf länger als breit, gewölbt, ungefurcht, Hinterrand in der Mitte keilförmig eingebuchtet, seitliche Einbuchtungen flacher, Punktierung einzeln, aber sehr deutlich; unterseite neben der Gulargrube mit einigen grösseren Punkten. Metarostrum zwischen den Augen mit einer grubigen Vertiefung beginnend, dreifurchig, mittlere Furche am tiefsten, Glanz geringer als auf dem übrigen Teil des Rüssels; Metarostrum mässig erweitert, schmal gefurcht; Prorostrum an der Basis kantig, nach vorn rundlich, an der Basis gefurcht, überall kräftig punktiert.

Fühlerglieder mehr oder weniger perlig, 2. Glied klein, quer, 3. kegelig, 4. fast kugelig, bis zum 8. etwas an Breite zunehmend, 9. und 10. bedeutend vergrössert, 11, stumpf-kegelig, kürzer als das 9. and 10. zusammen, Behaarung kräftig, einzeln, 9.-11. Glied wenigstens in der vorderen Hälfte mit dichter Unterbehaarung.

Prothorax einzeln, ganz zerstreut und sehr zart punktiert, nur am Hinterrand mit deutlicher Punktierung; Seiten und Unterseite unpunktiert.

Elytren parallel, gegen den Hinterrand schwach verengt, Hinterecken rechtwinkelig, Suturalfurche unpunktiert, alle anderen Furchen tief und gross punktiert, alle Rippen ausgebildt, 1.-3. flacherund breiter als die übrigen.

Beine normal, Hinterbeine nicht verdickt.

Metasternum und Abdomen nicht gefurcht, 5 Abdominal segment in der Mitte gefurcht, an den Seiten vertieft, kräftig punktiert und stark behaart.

Länge (total): 8.5. Breite (Proth): 2 mm circa.

Fiji-Inseln (Sammler: Muir 1906).

1 ♂ Typus in der Sammlung der Exp. Stat., Honolulu.

In meiner Bestimmungetabelle [1] kommt man zu *aruensis* Kln. In der Tat bildet *fijianus* mit *aruensis* Kln. und *papuanus* Kln. einen Verwandschaftskreis. *Papuana* scheidet im Vergleich aus, weil der Prothorax ohne jede Punktierung ist. Es wäre also nur ein Vergleich mit *aruensis* nötig. *Fijianus* unterscheidet sich von jener Art durch folgende Merkmale: Einfarbig metallische Grundfarbe, Kopf ohne Mittelfurche, Unterseite nur an der Gulargrube mit einzelnen Punkten, sonst unpunktiert und unbehaart. Fühler-

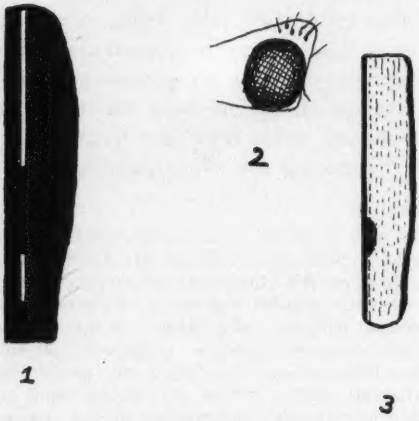

Fig. 1. Elytron of *Miolispa fijiana.*
Fig. 2. Lateral view of head, *Hypomiolispa ocularis.*
Fig. 3. Elytron of *Hypomiolispa ocularis.*

glieder nicht scharfkantig, breiter als lang, sondern mehr perlig, rundlich. Metasternum ohne Längsfurche, 5. Abdominal segment nicht herzförmig ausgehöhlt, sondern mit deutlicher Mittelfurche und seitlichen Vertiefungen. Von *aruensis* und *papuanus* trennt übrigens die rudimentäre Deckenzeichnung leicht und sicher.

Die neue Art ist die östlichste, die bekannt geworden ist. Über die Salomonen hinaus konnte ich die Gattung bisher nicht feststellen. Der Typus der Art ist rein papuanisch.

[1] Stett. Ent. Zeit. 80, 1919, p. 176-329 unt Int. Ent. Zeit. Frankfurt. (Fauna exotica).

Hypomiolispa ocularis n. sp.

Von robuster, gedrungener Gestalt. Rotbraun, Halsrand des Prothorax schwarz, Elytren mit schmaler, schwarzer Sutura und kleiner postmedianer Makel, Seitenrand, schmal, schwarz, Schenkel aller Beine mit breiter roter Binde, die Basis breit, die Knie schmal schwarz.

Kopf nach den Augen keilförmig verschmälert, gefurcht und gross punktiert, am Hinterrand gross behaart, Unterseite mit gleicher Skulptur. Augen sehr gross, den ganzen seitlichen Kopf erreichend, bis an den Hinterrand reichend, letzterer gerade, ohne Einkerbungen oder Zähnchen.

Metarostrum so lang wie der Kopf, kräftig, durchgehend gefurcht, zart punktiert und behaart, Mesorostrum rhomboid, aber nur wenig erweitert, so breit wie das Metarostrum gefurcht, Prorostrum kantig, gegen den Vorderrand schwach erweitert, in den basalen 2/3 breit gefurcht, Punktierung schwach und nur im ungefurchten Teil deutlicher; Unterseite vom Mesorostrum ab kräftig und breit gefurcht, am Mesorostrum borstig behaart.

2. Fühlerglied quer, 3. kegelig, etwas länger als breit, 4.-8. quer, scharfkantig, locker stehend, 9. und 10. vergrössert, länger als breit, 11. walzig, spitze stumpf-konisch, kaum so lang wie das 9. und 10. zusammen.

Prothorax eiförmig elliptisch, platt, breit, Mittelfurche breit, Punktierung gross, flach bis zu den Hüften reichend, Sternum ohne Punktierung, Hinterrand flach.

Elytren ohne besondere Merkmale, Furchenpunktierung gross, flach.
Beine normal, Klaugenlied der Hinterbeine walzig.

Metasternum 1. und 2. Abdominalsegment ungefurcht, gross punktiert, 3. und 4. ohne nennenswerter Skulptur, 5. in der Mitte vertieft, seitlich mit behaarten Erhöhungen.

Länge (total): 9 mm. Breite (Proth): 2 mm.

Philippinen, Los Baños.

1 ♂ Aus Coll. Pemberton.

Die neue Art gehört in die 2. Gruppe meiner Bestimmungstabelle [3]. Sie unterscheidet sich von allen Arten sofort und leicht dadurch, dass der Kopf an den Seiten keine Einkerbungen oder Zähnchen hinter den Augen hat. Es gibt überhaupt in der ganzen Gattung noch keine Art, deren Augen den ganzen Kopf bis zum Hinterrand einnehmen. Selbst in der 1. Gruppe meiner Tabellen, deren Arten alle einen glatten Kopfrand hinter den Augen haben, stehen dieselben niemals am Rand selbst, sondern lassen noch einen Platz für die Wangen. Ich kenne auch keine Art der 2. Gruppe, deren schwarze Beine rotgebänderte Schenkel hätte.

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[3] Ent. Blätter XIV, 1918 1-3, p. 76-84, 4-6 p. 157-169, 7-9, p. 216-226, 10-12, p. 291-348, 2 Taf.

Cyphagogus Eichhorni Kirsch.
Mitt. Zool. Mus. Dresd. I, 1875, p. 45.
Luzon, Los Baños.

Cyphagogus simulator Senna.
Bull. Soc. Ent. Ital. XXXIV, 1902, p. 155.
West-Borneo: Telok-Ayer.

Cerobates sexsulcatus Motsch.
Et. Ent. VII, 1851, p. 95.

Cerobates tristriatus F.
Syst. El. II, 1801, p. 554.
Amboina.

Jonthocerus mimus Senna.
Bull. Soc. Ent. Ital. XXXIV, 1902, p. 164.
West-Borneo: Manorg.

Trachelizus bisulcatus F.
Syst. El. II, 1801, p. 548.
Amboina.

Miolispa robusta Kleine.
Stett. Ent. Zeit. LXXX, 1919, p. 230.
Amboina.

Miolispa intermedia Senna.
Ann. Soc. Ent. Belg. XLI, 1897, p. 239.
Amboina.

Hypomiolispa compressa Kleine.
Ent. Blätter XIV, 1918, p. 341.
Ceram: Piroe.

Higonius crux Oliff.
Journ. Linn. Soc. Lond. XVII, 1883, p. 300 nota.
Ceram: Piroe.

Phocylides collaris Pascoe.
Ann. Mag. Nat. Hist. X, 1872, p. 325.
Ceram: Piroe.

Prodector laminatus Pascoe.
Journ. Ent. I, 1862, p. 392.
Ceram: Piroe.
Das ist der erste Fundort von den Molukken, bisher nur von Celebes bekannt.

Ithystenus spinosus Kleine.
Arch. Nat. LXXXIII, A. 7, 1917 (1919) p. 69.
Larat.

Schizotrachelus consimilis Kleine.
Ent. Blätter XIX, 1923, p. 166.
Amboina.

List of Brenthidae in the Collection of the Experiment Station of the Hawaiian Sugar Planters' Association

BY O. H. SWEZEY

(Presented at the meeting of July 7, 1927)

The beetles in this list have been collected by the various entomologists of the Experiment Station, H. S. P. A., on their trips to foreign countries in search of beneficial insects for introduction to Hawaii. They are chiefly from the Malay Islands, Philippines, Formosa, Fiji and South America. This collection was recently studied by Mr. R. Kleine, Stettin, Germany, and the species determined. There are 59 species in the list, 2 of them new to science, and described in the preceding paper.

Calodromini

Cyphagogus simulator Senna.
5 specimens, Telok Ayer, Borneo (Muir).

Cyphagogus eichhorni Kirsch.
1 specimen, Los Banos, P. I. (Pemberton).

Paraclidorhinus modigliani Senna.
1 specimen, Mowong, W. Borneo (Muir).

Stereodermini

Stereodermus pygmaeus (Gyll.).
14 specimens, Tena, Ecuador (Williams).

Cerobates formosanus Schönf.
1 specimen, Horisha, Formosa (Muir).

Cerobates sexsulcatus Motsch.
2 specimens, Amboina; 1, Makassar (Muir).

Cerobates tristriatus (Fab.).
1 specimen, Amboina; 1, Malay Peninsula (Muir).

Jonthocerus mimus Senna.
1 specimen, Manorg, W. Borneo (Muir).

TRACHELIZINI

Trachelizus bisculcatus (Fab.).
1 specimen, Amboina; 1, Klappan, Formosa (Muir).
1, Los Banos, P. I. (Pemberton).

Miolispa australiana Senna.
2 specimens, Babinda, N. Queensland (Muir).
1, Hambledon, Queensland (Pemberton).

Miolispa robusta Kleine.
2 specimens, Amboina; 2, Los Banos, P. I. (Muir).

Miolispa cruciata Senna
1 specimen, Borneo (Muir).

Miolispa granulata Kleine.
1 specimen, Pontianak, Borneo; 1, Mowong, W. Borneo (Muir).

Miolispa intermedia Senna.
2 specimens, Amboina (Muir).

Miolispa fijianus Kleine.
1 specimen, Ba, Fiji (Muir).

Hypomiolispa exarata (Dej.).
1 specimen, Manorg, W. Borneo (Muir).

Hypomiolispa compressa Kleine.
1 specimen, Piroe, Ceram (Muir).

Hypomiolispa bickhardti Kleine.
1 specimen, Pontianak, Borneo (Muir).

Hypomiolispa ocularis Kleine.
1 specimen, Los Banos, P. I. (Pemberton).

Higonius crux Oliff.
1 specimen, Piroe, Ceram (Muir).

ARRHENODINI

Prophthalmus tricolor Pow.
1 specimen, Amboina; 1, Piroe, Ceram (Muir).
1, Los Banos, P. I. (Williams).

Baryrrhynchus schroederi (Kleine).
5 specimens, Piroe, Ceram (Muir).
5 specimens, Los Banos, P. I. (Williams, Pemberton).

Baryrrhynchus poweri Roel.
1 specimen, Horisha, Formosa (Muir).

Baryrrhynchus lineicollis Pow.
1 specimen, Laloki, Papua (Muir).

Eupsalis testacea Kleine.
1 specimen, Amboina (Muir).

Arrhenodes exsertus Gyll.
1 specimen, Jabatay, Para (Williams).

Estenorrhinus forficatus (Gyll.)
1 specimen, Tena, Ecuador (Williams).

Caenorychodes serrirostris (Fab.).
1 specimen, Telok Ayer, W. Borneo (Muir).

Caenorychodes digramma (Boisd.).
1 specimen, Babinda, N. Queensland; 1, Laloki, Papua (Muir).

Caenorychodes splendens (Kirsch.).
1 specimen, Los Banos, P. I. (Muir).

Caenorychodes planicollis (Walk.).
1 specimen, Klappan, Formosa (Muir).

Caenorychodes versicolor Kleine.
1 specimen, Amboina (Muir).

Suborychodes intermedius Kleine.
1 specimen, Pontianak, Borneo (Muir).

BELOPHERINI

Ectocemus decemmaculatus (Montr.).
11 specimens, Laloki, Papua (Muir).
1, Hambledon, Queensland (Pemberton).

Ectocemus cinnamomeus (Hbst.).
1 specimen, Telok Ayer, W. Borneo (Muir).

Elytracantha contraria Kleine.
1 specimen, Piroe, Ceram (Muir).

ITHYSTENINI

Bolbogaster ctenostomoides Lacord.
1 specimen, Rewa, Fiji (Muir).

Phocylides collaris Pasc.
1 specimen, Amboina; 3, Piroe, Ceram (Muir).

Prodector laminatus Pasc.
3 specimens, Piroe, Ceram (Muir).

Ithystenus linearis Pasc.
10 specimens, Piroe, Ceram; 1, Laloki, Papua (Muir).

Ithystenus hollandiae (Boisd.)
1 specimen, Babinda, N. Queensland (Williams).
1, Hambledon, N. Queensland (Pemberton).

Ithystenus spinosus Kleine.
10 specimens, Larat (Muir).

Cediocera tristis Senna.
12 specimens, Mowong, W. Borneo (Muir).

Diurus shelfordi Senna.
11 specimens, Mowong, W. Borneo (Muir).

Diurus articulatus Senna.
2 specimens, Mowong, W. Borneo; 2, Pontianak, Borneo (Muir).

Diurus furcillatus (Gyll.).
1 specimen, Mowong, W. Borneo; 1, Pontianak, Borneo (Muir).

PSEUDOCEOCEPHALINI

Eubactrus semiaeneus Lacord.
6 specimens, Rewa, Fiji; 1, Ba, Fiji (Muir).

Schizotrachelus brevicaudatus Lacord.
1 specimen, Pontianak, Borneo (Muir).
7, Los Banos, P. I. (Pemberton).

Schizotrachelus bakeri Kleine.
4 specimens, Los Banos, P. I. (Pemberton).
1, Baguio, P. I. (Williams).

Schizotrachelus brunneus Kleine.
1 specimen, Los Banos, P. I. (Pemberton).

Schizotrachelus consimilis Kleine.
1 specimen, Amboina; 1, Los Banos, P. I. (Muir).

Schizotrachelus dichrous Lacord.
6 specimens, Babinda, N. Queensland; 1, Halifax, N. Queensland (Muir).

Schizotrachelus puncticollis (Boh.).
1 specimen, Mowong, W. Borneo (Muir).

Uropteroides gestroi Senna.
1 specimen, Piroe, Ceram (Muir).

BRENTHINI

Brenthus anchorago (L.).
2 specimens, Tena, Ecuador; 1, Campinas, Brazil (Williams).

Brenthus armiger Hbst.
15 specimens, Tena, Ecuador; 1, Milagro, Ecuador; 2, Blairmont, British Guiana; 2, Trinidad (Williams).

Brenthus approximatus Er.
3 specimens, Blairmont, British Guiana (Williams).

Claeoderes bivittatus Kirsch.
1 specimen, Tena, Ecuador (Williams).

The Hawaiian species of the genus Lispocephala Pokorny
(Diptera, Anthomyidae)

BY J. R. MALLOCH
U. S. Biological Survey, Washington, D. C.

(Presented by E. H. Bryan, Jr., at the meeting of February 3, 1927)

The insects dealt with in this paper consist in part of those listed under the genus Coenosia Meigen by P. H. Grimshaw in "Fauna Hawaiiensis." The genus Lispocephala is distinguished from Coenosia by the bristling of the hind tibia, the species of the latter having one anterodorsal and one anteroventral bristle, while those of Lispocephala have in addition to these bristles at least one near middle on the posterodorsal surface, and the more typical species have two anterodorsal and two posterodorsal bristles on the hind tibia. The Hawaiian species now before me differ from the more typical form of Lispocephala in several characters, but not so strikingly that I can consider them, or any section of them, as entitled to generic segregation. One or two of the more outstanding groups may be separated from the others as subgenera.

While this genus is apparently the most prolific in species, insofar as this family is concerned, in Hawaii, the segregates are not confined to the islands, as I have seen similar forms from Formosa, the Philippines, and other parts of the Orient.

I have been unable to examine the type specimens of Grimshaw's species, which are in the British Museum in London, but Mr. F. W. Edwards of that institution has endeavored to place them in my key, a copy of which I sent to him for that purpose. In this key I have used many characters not included by Grimshaw in his species descriptions, but nevertheless of primary importance in the classification of the species of this genus. I am convinced that there are yet many species to be discovered in these islands, and when sufficient material is available a careful comparison of the hypopygia of the males should be undertaken as the final criterion of specific identities.

The types of most of the species described herein will be returned to Mr. E. H. Bryan, Jr., for deposition in the Bernice P. Bishop Museum.

One Fijian species is included in the paper for comparison.

KEY TO THE SPECIES

1. Scutellum with one very long and two very short pairs of bristles, the latter mere hairs; thorax with one anterior short pair and two posterior long pairs of postsutural dorsocentral bristles; fore tibia with a median posterior bristle; mid tibia with one median anterodorsal and two posterodorsal bristles; longest hairs on basal half of arista distinctly longer than width of third antennal segment; lower calypter much larger than upper ..... *pallida* sp. n.
   Scutellum with four long bristles, or if but two long bristles, the lower calypter very small; anterior pair of the postsutural dorsocentral bristles not much shorter than the two posterior pairs 2

2. Fore and mid tibia each with a distinct posterior median bristle, the mid pair without a median anterodorsal bristle; head at least as high as wide when viewed from in front, generally higher 3
   Fore tibia with a median posterior bristle; mid tibia with one anterodorsal and two posterior bristles near middle; head wider than high 13
   Fore tibia without a median posterior bristle; mid tibia with a median posterior bristle; head wider than high 14
   Fore and mid tibiae both lacking posterior median bristles; head wider than high ..... *inconstans* sp. n.

3. Palpi and legs black, at most the bases of tibiae narrowly yellowish 4
   Palpi yellow, more than the bases of tibiae yellowish 5

4. Antennae deep black in both sexes; both pairs of postsutural intra-alar bristles present, the anterior pair moderately long ..... *ingens* Grimshaw
   Antennae brownish in female, in male with the third segment orange yellow; only the posterior pair of postsutural intra-alar bristles well developed ..... *pallidibasis* sp. n.

5. Fore tarsus partly flattened and broader than fore tibia (males only) 6
   Fore tarsus slender and normal in both sexes, not broader at any part than tibia 7

6. All femora entirely yellow ..... *latimana* Grimshaw
   All femora blackened at apices ..... *dilatata* sp. n.

7. Hind tibia with a long curved ventral bristle beyond middle which extends to, or almost to, apex of tibia 8
   Hind tibia with a short straight bristle on anteroventral surface which falls much short of attaining apex of tibia 11

8. Femora almost entirely black, only their extreme bases and apices yellowish; one pair of very long strong bristles on third visible abdominal tergite, the other tergal bristles very inconspicuous; abdomen densely grey dusted, distinctly shining only on the large black dorsal marks ..... *bispina* sp. n.

Femora largely or entirely yellow 9

9. Thorax and abdomen densely yellow pollinose and without distinct markings; median posterior bristle on fore tibia extending to apex of tibia in both sexes ..... *pollinosa* sp. n.

Thorax densely pollinose; abdominal tergites 3-5 with paired black spots; wings clouded on apical halves; femora not darkened at apices ..... *biseta* Grimshaw

Thorax more or less distinctly vittate, at least in female except in *valida;* abdomen with two or three of the tergites on apical part largely black; posterior median bristle on fore tibia not extending to apex in male 10

10. Wing distinctly infuscated on apical half; mid and hind femora, sometimes all femora, very distinctly blackened on apical third or fourth ..... *longipes* Grimshaw

Wing not at all blackened apically; femora entirely yellow in male, with a slight infuscation at apices in female, rarely in male ..... *dexioides* Grimshaw

Wings slightly darkened on apical halves; thorax not vittate ..... *valida* Grimshaw

11. Male with dense fine black hairs on basal half of ventral surface of hind femora, longest on posteroventral side, and without any posteroventral bristles; hairs on mid and hind tibiae longer than usual in same sex, the ventral bristle on hind tibia short and hair-like ..... *hirtifemur* sp. n.

Hind femur in male with sparser hairs and some outstanding posteroventral bristles 12

12. Upper half of frontal orbits glossy black, lower half densely yellowish grey dusted ..... *seminitida* sp. n.

Frontal orbits entirely densely greyish dusted ..... *orbitalis* sp. n.

13. Antennae black, abdomen and legs almost so; hairs on basal half of arista not as long as width of third antennal segment ..... *xenina* sp. n.

Antennae and legs yellow, abdomen largely so 13a

13a. Arista rather sparsely haired, longest hairs distinctly longer than width of third antennal segment ..... *plumiseta* sp. n.

Arista more closely haired, longest hairs distinctly shorter than width of third antennal segment ..... *seminigra* Grimshaw?

14. Hind tibia with three distinct anteroventral bristles; both pairs of intra-alar bristles present, anterior pair weak 15

Hind tibia with at most two anteroventral bristles 16

15. Palpi and femora fulvous, apices of mid and hind femora usually blackened, the hind pair conspicuously and broadly so; third antennal segment quite conspicuously reddish at base on inner side ..... *confluens* sp. n.

Palpi fuscous, paler basally; all femora black; antennae entirely black ..... *fuscobrunnea sp. n.*

16. Lower calypter not projecting beyond upper; frontal triangle forming an almost uniformly wide grey central stripe or vitta; arista plumose, haired almost to apex.....*tripuncta* sp. n.

Lower calypter projecting distinctly beyond upper; frontal triangle wide at upper extremity, gradually tapered to a sharp point anteriorly 16a

16a. Anteroventral surface of fore femur with a series of short stout black spines which gradually become longer from apex towards middle but do not extend to extreme base of femur, a similar but less regular series on posteroventral surface of same femur and apical half or more of both these surfaces of mid femur; arista very short-haired on basal half; legs yellow, tarsi darkened apically; dorsum of thorax grey pruinescent, almost without vittae in male, with five narrow brown vittae in female, the outer one on each side interrupted .....*brevispina* sp. n.

Fore femur without short stout anteroventral spines as above, at most with setulose hairs which are longest and strongest at base of femur 17

17. Hind tarsus in male with a fasciculus of four short black bristles at the apex of basal segment on its posteroventral side; antennae, palpi, and legs, yellow; anterior postsutural pair of dorsocentral bristles shorter than usual; both pairs of intra-alars present, posterior pair shortest.....*fasciculata* sp. n.

Hind tarsus without a fasciculus of short black bristles at apex of basal segments as above in either sex.....18

18. Femora black, sometimes the bases of mid and hind pairs yellowish; antennae entirely black, or with only the base of third segment reddish 19

Femora yellow, sometimes the apices of mid and hind pairs brownish or fuscous 20

19. Frons of female distinctly less than one-third of the head width at vertex and about twice as long as wide; face with dark brown dust and very slightly paler than frons; antennae entirely black; palpi fuscous; tibiae very little paler than femora.....*fuscofacies* sp. n.

Frons of female over one-third of the head width at vertex and but little longer than wide, or the face is white dusted and much paler than central part of the frons.....19a

19a. Palpi black or fuscous.....19b
Palpi yellow or testaceous.....19c

19b. Face pale brown dusted; frons fully one-third of the head width at vertex and not over 1.25 as long as wide; abdomen glossy black, with distinct white dusting narrowly at apices and bases of tergites .....*fuscobrunnea* sp. n.

Face whitish grey dusted; frons less than one-third of the head width at vertex and fully 1.5 as long as wide; abdomen densely pale grey dusted and with a median brownish vitta and a pair of black spots on most or all of the tergites.....*atratipes* sp. n.

19c. Face and parafacials whitish grey dusted; fore coxae and all femora fuscous and densely grey dusted; apices and lateral portions of abdominal tergites densely whitish grey dusted; preapical dorsal bristle on hind tibia longer than basal segment of hind tarsus, and over one-third as long as tibia; base of third antennal segment reddish.....*rufibasis* sp. n.

Face pale grey dusted, parafacials brown dusted; fore coxae and bases of mid and hind femora reddish or yellowish; no conspicuous pale dust on abdomen; preapical dorsal bristle on hind tibia not as long as basal segment of hind tarsus, and not over one-third as long as tibia.....*fusca* sp. n.

20. Mid femur with only one strong bristle at apex on posterior side; mid tibia with the posterior bristle distinctly basad of middle; hind tibia without median anteroventral bristle; small species, averaging about 3.5 mm. in length; thorax lead grey and without dorsal vittae .....*inconstans* sp. n.

Mid femur with two or three apical posterior bristles; mid tibia with the posterior bristle usually at, or close to, middle; hind tibia with one or more anteroventral bristles.....21

21. Hind femur with one outstanding posterodorsal and posteroventral bristle close to apex; thorax with quite distinct dorsal vittae.....22

Hind femur with two or three distinct posterodorsal bristles close to apex 24

22. Hind tibia with only one long posterodorsal and one long anteroventral bristle, the short one on each of these surfaces basad of middle almost invariably absent, preapical dorsal bristle on hind tibia less than one-third of the length of tibia; fore tibia and tarsus slender, their combined lengths strikingly greater than that of head and thorax together; abdomen glossy on entire dorsum....*striata* Grimshaw

Hind tibia with the usual short bristles basad of the long pair well developed, preapical dorsal bristle on hind tibia about half as long as tibia; fore tibia and tarsus combined, not, or but little longer than head and thorax together; abdomen with a broad grey dusted stripe on dorsum, sometimes inconspicuous.....23

23. Antennae and arista fuscous, apex of second and base of third segment of former yellowish; humeri black; posterior bristle on mid tibia close to middle.....*fusciseta* sp. n.

Antennae and base of arista yellow, third segment of former brownish at apex above; humeri partly yellowish below; posterior bristle on mid tibia about one-third from base of tibia..... *crassifemur* sp. n.

Third antennal segment and arista all black; all femora blackened at apices.....*dispar* Grimshaw

24. Ultimate section of fourth wing vein twice as long as preceding section; antennae and base of arista fulvous yellow.....25

Ultimate section of fourth wing vein about 1.5 as long as preceding section; arista and upper apical portion of third antennal segment brown 26

25. Legs entirely testaceous yellow; abdomen without blackish paired dorsal spots.....*oahuae* sp. n.

Legs yellow, tarsi and tips of hind femora darker; third and fourth abdominal tergites with paired blackish spots....*flavobasalis* Grimshaw

26. Frons opaque blackish brown except along the outer edge of orbits, the latter and face densely yellowish dusted; both pairs of intra-alar bristles well developed; hind femora broadly blackened at apices .....*confluens* sp. n.

Frontal orbits entirely yellowish or greyish dusted and paler than interfrontalia 27

27. Head and thorax densely yellow dusted, the latter without dorsal vittae; humeri yellowish; legs entirely yellow; both pairs of intra-alar bristles distinct.....*paloloae* sp. n.

Head yellowish grey dusted; thorax grey dusted, with fuscous dorsal vittae which are fused on disc; humeri fuscous; legs yellow, tarsi and apices of mid and hind femora blackened, bases of fore and mid tarsi in male paler; anterior intra-alar bristle lacking.....*subvittata sp. n.*

N. B. There are three of the species described by Grimshaw which are not included in the above key as they are unknown to me. Mr. F. W. Edwards has indicated to me their respective positions in the key but I am unable to definitely place them. He informs me that *rudis* Grimshaw runs to *striata* but has the posterior coxae dark, and the femora and tibiae entirely yellow. The other two species, *triangulifera* Grimshaw and *kauaiensis* Grimshaw, run to section 26, but none of the species therein included in my key appear to be either of these. The closest affinities appear to exist between *subvittata* and *triangulifera* but neither of the other two fit *kauaiensis* at all. For discussion of this matter see under *subvittata* in text.

Lispocephala pallida sp. n.

Male and female.—Pale yellowish testaceous, slightly shining. Face, frons, and cheeks, almost white. Thorax usually with a dark central vitta which is poorly defined, narrow anteriorly, covering the acrostichal region, broader posteriorly, where it suffuses the intradorsocentral area; sides of scutellum and the metanotum darker than remainder of thorax. Abdomen either entirely pale (male) or with the dorsum of apical three tergites largely brown or fuscous. Legs entirely pale. Wings hyaline. Calyptrae and halteres pale yellow.

Frons about one-third of the head width in female, slightly narrower posteriorly in male; longest hairs on arista as long as width of third antennal segment. Prescutellar acrostichals two-rowed; anterior pair of postsutural dorsocentrals very short and weak; apical and basal pairs of scutellar

bristles reduced to mere hairs. Abdomen subcylindrical in male, apical tergal bristles long, median series distinct on most of the tergites; processes of fifth sternite in male bare, obtuse at apices. Fore tibia without a median posterior bristle in male, with a long one in female; mid and hind tibia as indicated in key and as in *fasciculata:* hind tarsus simple. Venation normal. Lower calypter about twice as large as upper.

Length, 3 to 3.5 mm.

Type, male, Palolo Crater, Oahu, April 8, 1917 (Timberlake); allotype, Mt. Kaala, Oahu (Timberlake); paratypes, Kahuauli, Oahu, July 16, 1922 (E. H. Bryan Jr.); Punaluu, Oahu (O. H. Swezey). Five specimens.

An aberrant species which on the basis of the presence of but two long bristles on the scutellum might be considered as entitled to subgeneric distinction.

Lispocephala ingens (Grimshaw)

Male and female.—This species is very similar to *pallidibasis* described below, being similar in size, habitus, and general color. The antennae in both sexes are deep black, the abdomen in the male is even more extensively testaceous, while that of the female is usually entirely black, except the narrow apices to tergites, and the anterior pair of intra-alar bristles is quite long and strong. In the male the median posterior bristle on fore tibia extends almost to apex of tibia.

Length, 7 to 8 mm.

Seventeen specimens, only one of which is a male, all from Oahu.

Lispocephala pallidibasis sp. n.

Male.—Head black, frons opaque black, the triangle and orbits slightly brown dusted, the latter distinctly grey dusted at anterior extremities; face, cheeks, and occiput, densely grey dusted; basal two segments of antennae and arista except at base, fuscous, third antennal segment orange-yellow; palpi fuscous. Thorax black, quite densely grey dusted except on middle of mesonotum where it is distinctly shining and but slightly dusted, the vittae very faintly defined. Abdomen testaceous yellow, with grey dusting, blackened apically, a fuscous subtriangular mark on second tergite, and a broad black transverse mark on each of the next two tergites, the black markings shining. Legs black, bases of tibiae narrowly yellowish. Wings slightly smoky, most distinctly towards costa. Calyptrae whitish. Halteres yellow.

Frons at vertex about one-sixth of the head width, a little narrowed to anterior margin; ocellar bristles about as long as postverticals; arista very short haired on about the basal third. Anterior pair of presutural dorsocentrals very small; anterior intra-alars minute or lacking. Abdomen cylindrical, apical bristles long on tergites 3 to 5; processes of fifth sternite broad, subtruncate at apices, their inner apical angle slightly rounded. Fore tibia with the posterior median bristle very short and weak, hardly distinguishable from the other hairs; mid tibia with a short median posterior bristle; hind femur with a few bristles on apical third of anteroventral and

posteroventral surfaces, longest and strongest on former, the ventral surface rather densely covered with short black hairs; hind tibia with the posterodorsal bristles almost or quite indistinguishable, the two anterodorsal bristles very unequal in length, and the anteroventral one short and weak. Inner cross vein of wing about three-sevenths from apex of discal cell.

Female.—Differs from the male in having the third antennal segment brown or fuscous, the thoracic dorsum more extensively shining, only the sides of the basal two segments of abdomen testaceous, the median posterior bristle on fore tibia and the anteroventral one on hind tibia very long and strong, and almost the entire anteroventral and posteroventral surfaces of hind femur strongly bristled.

Length, 7 to 8.5 mm.

Type, male, and allotype, Punaluu, Oahu (O. H. Swezey). Paratypes, one male and 17 females, all from localities in Oahu.

Lispocephala latimana (Grimshaw)

I have not seen this species. It ought to be possible to distinguish it from the next species, which it most resembles in the male sex, by the characters given in the key and those mentioned after the description of *dilatata*.

Lispocephala dilatata sp. n.

Male—Head fuscous, densely yellowish grey dusted except on interfrontalia, antennae, basal two segments or arista, and the palpi, testaceous yellow. Thorax fuscous, densely brownish grey dusted, very slightly shining on dorsum, and almost without traces of vittae. Abdomen translucent yellowish on most or all of the basal two segments, largely blackened apicad of these, densely yellowish dusted, with a small dark triangular spot on middle of hind margin of second tergite, a large black spot, which is slightly shining, on each of the next two tergites, and a smaller one on fifth; fifth sternite yellow. Legs yellow, coxae, fore femora except bases, and the apices of hind femora, blackened; hind tarsi fuscous. Wings yellowish hyaline, veins yellow basally, dark apically. Calyptrae yellowish. Halteres yellow.

Frons narrower than usual, not one-fifth of the head width at vertex and but little widened anteriorly; ocellar bristles rather long for this group, equal to the postverticals; each orbit with six or seven bristles; arista very short haired basally; hairs on palpi longer and finer than usual. Anterior presutural pair of dorsocentral bristles and anterior pair of postsutural intra-alars short but distinct; sternopleura with short fine hairs below the bristles. Third and fourth tergites each with a pair of short strong discal bristles in addition to the apical series; processes of fifth sternite broad, truncate at apices, their inner apical angles slightly rounded. Fore tibia with a long strong posterior bristle at middle from which to apex there extends a series of equally long but fine bristles, the ventral surfaces with long setulose black hairs; fore tarsus with basal two segments equal in length, the basal one gradually widened from base to apex and slightly lobate at apex on posterior side, the second segment as wide at base as first is at apex, and gradually narrowed to apex, the basal segment with moderately long setulose black hairs along the posterior side; mid femur attenuated apically,

with bristles on basal half on anteroventral and posteroventral surfaces; mid tibia with a long posterior bristle at middle, and rather dense erect black ventral hairs which are a little longer than tibial diameter; hind trochanters with rather numerous stiff short black hairs; hind femur with strong anteroventral bristles, and on apical third on posteroventral surface numerous long black hairs; hind tibia with the two posterodorsal bristles very short, the anterodorsal and anteroventral bristles long, and the ventral surface with short erect black hairs. Inner cross vein about three-sevenths from apex of discal cell.

Length, 8.5 mm.

Type, Pahala, Nov. 1918 (F. X. Williams).

This species differs from *latimana* Grimshaw in having the fore tibia much longer and stronger haired, the basal two segments of fore tarsus equal in length, and in several other characters.

Lispocephala bispina sp. n.

Female.—Head fuscous, densely yellowish grey dusted; interfrontalia opaque fuscous; antennae dusky testaceous yellow, third segment fuscous except at base; arista fuscous, a little paler basally; palpi testaceous yellow. Thorax black, densely yellowish grey dusted, dorsum with three dark brown vittae. Abdomen concolorous with thorax, yellowish at base, a small dark mark at apex of first tergite, and a large one on disc of the next three which is more or less divided by a pale longitudinal central line. Legs fuscous, fore coxae, almost all of fore tibiae, and the bases of mid and hind tibiae, testaceous yellow. Wings greyish hyaline, a little brownish on costal half. Calyptrae and halteres yellowish.

Ocellar bristles of moderate length, equal to postverticals; arista short haired on basal half; frons slightly narrowed to vertex where it is not one-fifth of the head width. Thorax with the anterior presutural pair of dorsocentrals short but distinct, and the anterior intra-alars lacking. Only one pair of long strong bristles on abdomen, situated on middle of hind margin of third visible tergite. Fore tibia with the posterior median bristle long, strong, and curved; mid femur with a few posteroventral and anteroventral bristles on basal half, and two apical posterodorsal bristles; mid tibia with a short posterior median bristle; hind femur with quite strong anteroventral and posteroventral bristles; hind tibia with the posterodorsal pair of bristles inconspicuous, the anterodorsal pair and the anteroventral one long, the latter extending beyond apex of tibia. Wing as in last species.

Length, 8 mm.

Type, without locality (Fullaway).

Lispocephala longipes (Grimshaw)

A very striking species, readily distinguished in the male sex by the conspicuously blackened apical halves of the wings. In the female the wings are not so conspicuously blackened but the mid and hind femora are blackened on a large part of their apical halves, and the tibiae are also more or less noticeably darkened, at least those of the mid and hind legs.

Length, 8 to 9 mm.

Localities, Haipuaena, Maui, 6.29.20 (C. N. Forbes); Kilauea, Hawaii, March 1892, and 2.24.19 (O. H. Swezey); Kahuku, Kau, Hawaii, 2.1.17 (W. M. Giffard); Mt. Olympus, Oahu, 9.8.18 (Timberlake).

Lispocephala biseta (Grimshaw)

I have not seen this species, but Mr. F. W. Edwards who has examined the type expresses the opinion that it may be the female of *latimana* Grimshaw. It is inserted in the key on the basis of characters gleaned from that examination.

Lispocephala pollinosa sp. n.

Male.—Head fuscous, densely yellow pollinose, the interfrontalia fuscous, rugous centrally, entire orbits dusted; antennae and palpi yellow; arista fuscous, yellow at base. Thorax fuscous, ground color obscured by dense yellow dust, the mesonotum not shining nor vittate. Abdomen testaceous yellow, translucent and shining basally on sides, elsewhere densely yellow pollinose and without distinct markings. Legs dull testaceous yellow, tarsi of fore and mid pairs darker, fore coxae whitish dusted. Wings yellowish hyaline. Calyptrae yellowish. Halteres yellow.

Frons at vertex about one-third of the head width, widened anteriorly; ocellar bristles shorter than postverticals; arista short haired basally. Anterior presutural dorsocentrals very small; anterior intra-alars lacking. All abdominal tergites with strong latero-median bristles, third, fourth and fifth each with a pair of strong median discal and a series of apical bristles; fifth sternite with the processes short, broad, and truncate. Fore tibia with the posterior median bristle extending to apex of tibia; mid femur not exceptionally attenuated at apex, and with two apical posterodorsal bristles; mid tibia with a rather short posterior median bristle; hind femur with sparse long anteroventral and posteroventral bristles; hind tibia with the posterodorsal bristles short but distinct, the anterodorsal bristles unequal, but the shorter one longer than the posterodorsal pair, and the anteroventral bristle extending almost to apex of tibia. Inner cross vein a little beyond middle of discal cell.

Female.—Differs from the male in having the abdomen less strongly bristled, the fourth tergite lacking the median discal pair of bristles and having the apical bristles weak. In other respects similar to male.

Length, 8 to 9 mm.

Type, male, and allotype, Wailua, Maui, 7.2.20 (E. H. Bryan, Jr.); paratype female, Honomanu, Maui, 6.23.20 (E. H. Bryan, Jr.).

Lispocephala dexioides (Grimshaw)

This species is apparently one of the commonest of the genus. It has much the same appearance as *dilatata*, but the male is readily distinguished by the simple fore tarsi, and the other characters listed in the foregoing key. The frons in both sexes is about one-fifth of the head width at

vertex, the arista is haired almost to the middle, with the longest hairs about as long as width of third antennal segment, the processes of fifth abdominal sternite of male are truncate at apices, the hind femur in same sex is more noticeably haired at base ventrally than is usual, the antennae of the male are pale yellow, and those of the female have the third segment largely browned apically.

Length, 6 to 7 mm.

Localities, Olaa, Hawaii, 2,500 feet (W. H. Ashmead, U. S. Nat. Mus.), and July 1922 (W. M. Giffard); Honokaa, Hawaii, 2,500 feet, 5.28.1922 (F. X. Williams); S. Kona, Hawaii, 8.11.1919 (O. H. Swezey); Hamakua, Hawaii, 4.15.1906 (O. H. Swezey); Kilauea, Hawaii, June 1905 (Terry); Hualalai, Hawaii, 7.20.1922 (W. H. Meinecke); and Honolulu, Oahu, (E. A. Back).

Lispocephala valida (Grimshaw)

This species is unknown to me. It is inserted in the key on basis of an examination of the type made by Mr. F. W. Edwards.

Lispocephala hirtifemur sp. n.

Male—Occiput, cheeks posteriorly, frontal orbits except at anterior extremities, and ocellar triangle, fuscous, interfrontalia brown, paler anteriorly; face rufous; antennae and palpi yellow, arista fuscous, yellow at base. Thorax fuscous, densely grey dusted, greasy in the type, but apparently vittate on dorsum. Abdomen with the basal two segments, and sides of third, translucent yellow, apical segments fuscous, hypopygium yellowish, basal two tergites each with a dark dorsocentral mark which is widened behind, central portion of tergites 2 and 3 darkest, the sides grey dusted. Legs honey-yellow, slightly darker at apices of hind femora. Wings greyish hyaline, darkest along costa. Calyptrae and halteres yellow.

Frons almost parallel-sided; ocellar bristles of moderate length and very fine; arista short haired on basal half. Anterior pair of presutural dorsocentrals very short; anterior intra-alar pair lacking. Processes of fifth sternite broad, subtruncate at apices, inner apical angle slightly rounded. Fore tibia with a rather short posterior median bristle and inconspicuous ventral hairs; mid femur with some fine posteroventral and anteroventral bristles on basal half and two posterior bristles at apex; mid tibia with rather evident ventral hairs, and a posterior median bristle; hind femur with quite dense black hairs on basal half of ventral surfaces, the hairs longest apically, but not as long as the femoral diameter, a series of long bristles on apical half of anteroventral surface; hind tibia with fine hairs about as long as tibial diameter, anterodorsal surface with two long submedian bristles, the anteroventral bristle short and fine, and the posterodorsal bristles almost indistinguishable from the fine hairs; hairs on dorsal surface of hind tarsus longer than usual. Outer cross vein at three-sevenths from apex of discal cell.

Length, 6.5 mm.

Type, Kaholuamano, Kauai, April 1920 (J. A. Kusche).

Lispocephala seminitida sp. n.

Male.—General color and habitus as in *dexioides* Grimshaw. Differs from most other species in having the upper halves of the frontal orbits, from the strong anterior backwardly curved bristles, almost wholly glossy black and sharply differentiated from the anterior grey dusted portions; antennae entirely pale yellow; arista fuscous, pale at base; palpi yellow. Thorax fuscous, grey dusted, least densely so on disc of mesonotum where it is slightly shining and has three faint narrow dark vittae. Abdomen testaceous yellow, the dorsum with a large black mark on each segment which gives it the appearance of being wholly black from apex of first tergite, only a narrow fascia of grey dust present at base of third and another at base of fourth tergite, the extreme hind margins and rather broad lateral margins of these tergites testaceus yellow; fifth sternite testaceous yellow. Legs yellow, fore coxae white dusted, apices of mid and hind femora, and all of hind tarsi, darkened. Wings greyish hyaline, slightly browned costally beyond apex of first vein. Calyptrae whitish. Halteres yellow.

Frons at vertex about one-sixth of the head width, slightly widened anteriorly; ocellar bristles barely as long as the postverticals; arista with short hairs basally. Anterior pair of presutural dorsocentrals very short; anterior pair of intra-alars not developed; sternopleura with some fine hairs in addition to the bristles. Lateromedian bristles on abdominal tergites 2 and 3 strong, apical bristles present only on middle of third tergite, an entire series on fourth, the fifth with two median and two apical bristles; processes of fifth sternites broad and short, truncate at apices. Fore and mid tibiae each with a short median posterior bristle; mid femur attenuated at apex, with two apical posterior bristles; hind femur with sparse long anteroventral and posteroventral bristles, and some rather long black hairs on basal portion of ventral surface; hind tibia without distinct posterodorsal bristles, the anteroventral bristle short and fine, and the anterodorsal pair very unequal in length. Inner cross vein at about three-sevenths from apex of discal cell.

Length, 6.5 mm.

Type, Wailupe Ridge, Oahu, 5.6.17 (J. C. Bridwell).

Lispocephala orbitalis sp. n.

Male.—This species is similar to the preceding one in all features except that the frons is wider, with the entire orbits densely pale grey dusted, the first visible tergite of abdomen has a narrow black dorsocentral mark and the second has one a little wider, and is not so largely black. Structurally the two species are very similar, but the legs of *orbitalis* are longer and more slender than those of *seminitida*.

Length, 7-7.5 mm.

Type, Glenwood, Hawaii, 3.2.1919 (O. H. Swezey); paratypes, Kilauea, Hawaii, July 1919 (O. H. Swezey); and 1901, at 4,000 feet level (W. H. Ashmead, U. S. Nat. Mus.).

Lispocephala xenina sp. n.

Female.—Head black, occiput greyish dusted, frons dark brown dusted, shining round bases of bristles; face whitish dusted; antennae black; palpi

brownish yellow. Thorax black, shining, disc with slight brown dusting, lateral margins and pleura grey dusted. Abdomen black, almost glossy, the hind margins of tergites each with a narrow pale line. Legs black, tibiae hardly paler. Calyptrae grey, margins brown. Halteres yellow.

Frons as in *pallida*, but the ocellar bristles are long and strong; arista with short hairs on basal half. Anterior postsutural dorsocentrals shorter than the other two postsutural pairs, but not conspicuously so; scutellar bristles subequal. Median and apical bristles present on most of the abdominal tergites. Fore tibia with a long median posterior bristle; mid tibia with an anterodorsal and one long and one short posterodorsal bristle; hind tibia bristled as in *pallida*, but the bristles longer and stronger. Penultimate section of fourth vein about two thirds as long as ultimate section.

Length, 4-5 mm.

Type, S. Kona, Hawaii, August 16, 1919 (O. H. Swezey).

Lispocephala plumiseta sp. n.

Male and female.—Head fuscous, frontal orbits, triangle, and occiput, densely yellowish grey dusted; interfrontalia rufous; face and cheeks yellowish, yellow dusted; antennae orange, darker at base; palpi yellow. Thorax densely yellowsh grey dusted, not distinctly shining, and not vittate. Abdomen yellow on basal two segments, first with a small dorsal brown triangle, second with a large triangular black mark, next two tergites black, grey dusted at bases, apex of third narrowly yellow. Legs yellow, tarsi darkened apically.

Differs from *xenina* in having the longest hairs on arista as long as width of third antennal segment; the hind tibia with two anteroventral bristles in both sexes.

Type, male, and allotype, Glenwood, Hawaii, 3.2.1919 (O. H. Swezey).

Lispocephala seminigra (Grimshaw)

I have identified this species on the basis of information supplied by Mr. F. W. Edwards of the British Museum from an examination of the type specimen. The specimens before me are females.

Localities: Kaiwiki, Hawaii, 9.22.1918 (O. H. Swezey); Opaeula, Oahu, 3.30.1913 (O. H. Swezey).

Lispocephala confluens sp. n.

Female.—Frons opaque blackish brown, outer edge of orbits yellow dusted, triangle but little paler than remainder of frons; face and cheeks densely yellowish dusted; antennae black, base of third antennal segment on inner side reddish; arista black; palpi yellow. Thorax black, densely yellowish grey dusted; dorsum with the dark vittae fused so that all of mesonotum except the lateral margins is blackish brown. Abdomen more or less yellow at base, tergites grey dusted on sides, with a large shining black

mark covering all of discal part of each tergite, leaving only a narrow pale hind marginal band on each. Legs yellow, hind femora blackened on apical third, mid pair slightly darkened, tarsi black, basal segment of fore and mid pairs largely yellowish, that of hind pair indistinctly so. Wings greyish hyaline. Halteres yellow.

Frons at vertex about one third of the head width, widened anteriorly, hardly longer than its anterior width; arista with fine short hairs to near middle. Anterior presutural dorsocentral bristles fully half as long as posterior pair; both pair of intra-alars present, not strong. Fore tibia without a posterior median bristle; mid tibia with a posterior median bristle; hind tibia with three anteroventral, two posterodorsal, and two anterodorsal bristles in addition to the apical bristles. Ultimate section of fourth vein not 1.5 as long as penultimate.

Length, 7 mm.

Type and one paratype, Maui, July 9, 1919 (Timberlake).

Lispocephala fuscobrunnea sp. n.

Female.—Head black, densely brown dusted, the dust darkest on frons, the inter-frontalia black each side of the triangle; antennae and arista black; palpi fuscous, yellowish basally. Thorax black, very slightly shining, dorsum quite densely dark brown dusted, the submedian vittae evident only in front and when the thorax is seen from the side and in front; pleura brown dusted above and centrally, whitish dusted below and in front. Abdomen noticeably shining, black, apices of tergites narrowly testaceous and, like the bases, whitish dusted, the dorsum with a pair of poorly defined black subtriangular spots on each tergite, the remainder of surface brownish dusted when seen from behind, fourth visible tergite with a dark central spot at base. Legs fuscous, fore coxae and all tibiae yellowish brown. Wings slightly and evenly smoky. Calyptrae brown. Halteres yellow.

Frons over one third of the head width, and barely longer than its anterior width, triangle extending almost to anterior margin of frons; orbital bristles (4) alternately long and short; outer vertical bristles about half as long as inner; arista short haired on basal half. Anterior pair of presutural dorsocentrals about half as long as posterior pair; anterior pair of intra-alars weaker than posterior pair. Third and fourth visible tergites with median and apical bristles. Fore tibia without a median posterior bristle; fore tarsus distinctly longer than tibia; mid tibia with a median posterior bristle; mid and hind femur each with three apical posterior bristles; hind tibia with two anterodorsal, two posterodorsal, and three anteroventral bristles. Inner cross vein at middle of discal cell; ultimate section of fourth vein not 1.5 as long as penultimate.

Length, 7 mm.

Type, Pahala, Hawaii, April 1918 (F. X. Williams).

Lispocephala tripuncta sp. n.

Female.—Head fuscous, densely grey dusted, interfrontalia reddish in front; antennae brownish, base of third segment testaceous; arista brown; palpi testaceous. Thorax black, densely grey dusted, with traces of three or five brown vittae on dorsum. Abdomen testaceous yellow, sometimes

more or less infuscated, and greyish dusted, first visible tergite with three faint dark marks, second and third each with three dark spots, the lateral spots darkest, fourth with two large black subtriangular spots, and a small blackish central mark on anterior margin. Legs testaceous yellow, apical tarsal segment darker. Wings hyaline. Calyptrae and halteres yellow.

Frons at vertex about one fourth of the head width, widened anteriorly, triangle narrow, about as wide as either orbit on most of its length, extending to anterior margin of frons; arista haired on entire length, longest hairs at least as long as width of third antennal segment. Anterior presutural pair of dorsocentral bristles very short; anterior pair of postsutural dorsocentrals of moderate length; both pairs of intra-alars rather short; anterior pair of scutellar bristles not half as long as apical pair, no hairs between the latter. Abdominal bristles short and fine. Fore tibia without a median posterior bristle; mid femur with short closely placed black bristles on apical halves of anteroventral and posteroventral surfaces, most marked on latter, and with one preapical posterior bristle; mid tibia with a median posterior bristle; hind femur with one preapical posterodorsal bristle; hind tibia with one anteroventral, two posterodorsal, and two anterodorsal bristles. Lower calypter rudimentary, much smaller than the upper one. Inner cross vein at middle of discal cell; ultimate section of fourth vein about twice as long as penultimate.

Length, 3.75 mm.

Type, Nadi, Fiji, 6.10.1913 (J. F. Illingworth).

This species differs from all of those from the Hawaiian Islands in having the lower calypter very small and from all except *pallida* in having the scutellar bristles very uneqaul in length. It might be justifiably considered as entitled to subgeneric distinction but a fuller knowledge of the genus is a desideratum to a clear interpretation of subgeneric relations and such is not possible at this time because of lack of material from different localities.

Lispocephala brevispina sp. n.

Female.—Head testaceous, densely greyish or yellowish dusted; occiput fuscous except on lower margin, obscured by grey dusting; interfrontalia partly brown; third antennal segment except at base, and the arista, dark brown; palpi testaceous. Thorax fuscous, subopaque, densely grey dusted, propleura and lower portion of humeri testaceous, dorsum with five narrow brcwn vittae, the outer one on each side least distinct. Abdomen fuscous, grey dusted and slightly shining, base of first, and the narrow apices of all tergites testaceous yellow, second to fourth visible tergites each with a pair of dark spots, those on fourth at apex, small, and connected with a central dark vitta. Legs entirely testaceous yellow. Wings greyish hyaline. Calyptrae and halteres yellow.

Frons about one third of the head width, parallel-sided; ocellar bristles longer than postverticals; each orbit with four bristles and a few lateral hairs; arista with short hairs basally. Anterior pair of presutural dorso-

central bristles short; anterior postsutural intra-alars lacking, the short surface hairs usually sparse, only two on disc of scutellum, the margin with four long and two short bristles; sternopleura without fine hairs. Third and fourth visible tergites each with discal and apical bristles. Fore femur with a series of quite strong short black bristles on entire anteroventral surface, the basal three or four weakest and longest, the posteroventral surface with a few short setulae or bristles between the longer bristles and mesad of them a more complete series of similar short bristles; fore tibia without a median posterior bristle; mid femur almost as fore femur, the anteroventral series of short bristles not so pronounced; mid tibia with a median posterior bristle; hind femur with long sparse anteroventral and posteroventral bristles, and some short black setulae apically on anteroventral surface; mid and hind femora each with two preapical posterodorsal bristles; hind tibia with the two posterodorsal bristles well developed, the pair of anterodorsal bristles unequal in length, and the anteroventral one short. Inner cross vein close to middle of discal cell.

Length, 6 mm.

Type, Mt. Kaala, Oahu, 1917 (Timberlake); paratype, a headless female, ex nest of *Hylocrabro tumidoventris*, S. E. Koolau Mts., Oahu, February 9, 1919 (J. C. Bridwell).

The only Hawaiian species with this type of femoral armature.

Lispocephala fasciculata sp. n.

Male.—Head testaceous, occiput and frons fuscous, the former grey dusted, the latter brownish yellow dusted; antennae and palpi yellow; arista brown, yellow at base. Thorax fuscous, densely grey dusted, not vittate. Abdomen testaceous yellow, a brown triangular mark on first visible tergite, and a larger one on second which covers entire dorsum posteriorly, third and fourth tergites nearly all dark; hypopygial claspers yellow. Legs yellow, tarsi hardly darker. Wings slightly brownish. Calyptrae and halteres yellow.

Frons one third of the head width, anterior reclinate orbital bristle nearer to anterior than to vertical bristle; arista short haired on basal half; eye from side over 1.5 as high as long. Anterior presutural pair of dorsocentral bristles much shorter than posterior pair; anterior pair of postsutural dorsocentrals also short; apical scutellar bristles lacking in type, but probably shorter than other pair. Abdomen cylindrical, processes of fifth sternite largely glossy, their apices forming a short finger-like process. Fore tibia with a very fine weak median posterior bristle; basal segment of fore tarsus half as long as tibia; mid femur with two preapical posterior bristles; mid tibia missing in type; hind femur with a few long sparse anteroventral and one or two shorter posteroventral bristles; hind tibia with a long anterodorsal and posterodorsal bristle at middle, and basad of these a weak setula on each surface, the anteroventral surface with two weak bristles; apex of basal segment of hind tarsus with a fasciculus of four short black bristles on its posteroventral side. Inner cross vein at middle of discal cell; ultimate section of fourth vein twice as long as penultimate. Lower calypter twice as large as upper.

Length, 3.5 mm.

Type, Kilauea, Hawaii, 4,000 feet (W. H. Ashmead, U. S. National Museum).

This is the only species in which the male has a fasciculus at apex of basal segment of hind tarsus so far as I am aware. This fasciculus is very probably not present in the female of the species.

Lispocephala fuscofacies sp. n.

Female.—Head entirely opaque black, the face and anterior portions of frontal orbits brownish fuscous dusted; antennae, arista, and palpi, black. Thorax black, with dark brown dust, and not distinctly vittate. Abdomen concolorous with thorax, but more shining because of less dense dusting on dorsum. Legs black, tibiae brownish. Wings slightly and evenly brownish hyaline. Calyptrae brown. Halteres brown-yellow.

Frons at vertex a little less than one third of the head width, almost parallel-sided, and about 1.5 as long as wide; arista pubescent basally. Anterior presutural pair of dorsocentrals about one third as long as posterior pair; both pairs of intra-alar bristles well developed; sternopleura with one or two hairs between the bristles. Apical and discal bristles present on third and fourth tergites, those at apex of fourth long. Fore tibia without a median posterior bristle; mid femur with a short bristle near base and an unusually long one near middle on posteroventral surface, and two preapical posterior bristles; mid tibia with a median posterior bristle; hind femur with a few of the anteroventral bristles beyond middle quite long, and one or two preapical posterodorsal bristles; hind tibia with the lower anterodorsal bristle fully half the length of tibia, the anteroventral bristle of moderate length. Inner cross vein at middle of discal cell; ultimate section of fourth vein about 1.5 as long as penultimate section.

Length, 5.5 mm.

Type, Waianae Mts., Oahu, (J. F. Illingworth).

Lispocephala atratipes sp. n.

Male.—Head black, grey dusted except on interfrontalia when seen from behind, the frontal triangle brownish behind; antennae black, second segment with some whitish dust; arista black; palpi fuscous or brownish. Thorax and abdomen black, densely pale grey dusted, disc of mesonotum and scutellum broadly fuscous, the former rather distinctly vittate; abdomen slightly testaceous on lateral posterior margins of basal two or three tergites, and less so on lateral incurved portions, each tergite with a pair of large black spots on disc, the central space between these filled in with a broad fuscous vitta. Legs black, bases of tibiae narrowly testaceous. Wings greyish hyaline. Calyptrae white. Halteres yellow.

Frons at vertex fully one fourth of head width, a little widened anteriorly; ocellar bristles quite long, exceeding postverticals in length; arista very short haired on basal half. Thorax with the anterior pair of presutural dorsocentrals about half as long as posterior pair; both pairs of intra-alars developed. All tergites of abdomen with apical bristles, strongest on sides; fifth sternite with a short blunt protuberance on apical inner angle of each

process. Fore tibia without a median posterior bristle; mid femur with a few posteroventral bristles on basal half; mid tibia with a median posterior bristle; hind femur with sparse long bristles on anteroventral and basal half of posteroventral surface; hind tibia with two anterodorsal, and two posterodorsal bristles, the one nearest middle on both surfaces much the longest, anteroventral bristle rather short. Inner cross vein a little beyond middle of discal cell.

Female.—Similar to the male, but with the disc of thorax less suffused and more distinctly vittate, and the abdomen pointed.

In both sexes the sternopleura is either furnished with only three long bristles or it has but one weak additional hair near center.

Length, 5-5.5 mm.

Type, male, and two paratypes Kilauea, Hawaii, 8.1.1919 (O. H. Swezey); allotype and one male paratype, same locality and collector, 6.27.1917; paratypes, two females, Pahala, Hawaii, April 1918 (F. X. Williams); one male and one female, Kamoku, Molokai, 7.15.1910 (D. T. Fullaway).

This species appears to me to be that listed by Grimshaw as *Coenosia* sp. (14), on page 41 of "Fauna Hawaiiensis." His only specimen was a female from Kilauea.

Lispocephala rufibasis sp. n.

Female.—Head fuscous, densely pale grey dusted; cheeks and lower part of face appearing yellowish through the dust; frons brownish dusted except on the outer edge or orbits; antennae black, extreme apex of second segment, and base of third, reddish; palpi testaceous. Thorax black, densely grey dusted, dorsum with three or five brown vittae which may be more or less confluent on part of disc. Abdomen similar to that of *atratipes*, the paired dorsal spots black and not sharply defined, none on fourth visible tergite. Legs black, trochanters ,extreme tips of femora, and all of the tibiae testaceous yellow. Wings greyish hyaline. Calyptrae white. Halteres yellow.

Frons at vertex a little less than one third of the head width, widened to anterior margin, and not 1.5 as long as its anterior width, triangle extending to anterior margin of frons, the ocellar bristles of moderate length; arista almost bare. Anterior presutural pair of dorsocentral bristles over half as long as posterior pair; both pairs of intra-alar bristles well developed. Abdomen with the apical bristles on third tergite longer than those on other tergites, but not conspicuous. Fore tibia without a median posterior bristle; mid tibia with a median posterior bristle; hind tibia with the bristles as in *atratipes*, the preapical dorsal bristle about half as long as tibia. Inner cross vein at middle of discal cell; ultimate section of fourth vein about 1.25 as long as penultimate.

Length, 7 mm.

Type, Kamoku, Molokai, 7.15.1910 (D. T. Fullaway); paratype, Kilauea, Hawaii, 4,000 feet, (W. H. Ashmead, U. S. Nat. Mus.).

Lispocephala fusca sp. n.

Male and female.—Head black, lower part of face and the cheeks appear ing yellowish under the dusting; frons fuscous, the orbits and triangle with dark brown dust, and but little paler than the interfrontalia; face with dense white dust; parafacials brown dusted; cheeks with whitish dust; occiput dusted with grey below, with brown above; antennae and arista entirely black; palpi testaceous yellow. Thorax fuscous, dorsum with dark brown dust and almost without dark vittae, humeri and pleura grey dusted, the latter more brownish above. Abdomen fuscous, brownish dusted, the tergites more greyish on anterior, posterior, and lateral margins in male, but without any well defined markings. Legs fuscous, fore coxae, bases of fore tibia, and of mid and hind femora, reddish. Wings slightly smoky. Calyptrae brown. Halteres yellow.

Frons at vertex fully one third of the head width, slightly widened anteriorly, and about 1.25 as long as its anterior width, triangle extending to about middle of frons; arista pubescent on basal half. Thorax similar to that of *rufibasis*. Procesess of fifth sternite in male broadly rounded at apices. Legs bristled as in last species, but the preapical dorsal bristle of hind tibia is not over one third the length of tibia.

Length, 6 mm.

Type, male, allotype, and one male paratype, Waianae Mts., Oahu, (J. F. Illingworth).

Lispocephala inconstans sp. n.

Male and female.—Head fuscous, anterior margin of interfrontalia rufous, face and cheeks testaceous, covered with dense white dust, the occiput and frons grey dusted; antennae in male entirely orange-yellow, in female with the third segment more or less browned apically; arista fuscous, yellow at base; palpi orange-yellow. Thorax fuscous, densely lead-grey dusted, dorsum with faint traces of dark vittae. Abdomen of male with the basal two visible tergites, and hind and lateral margins of third, testaceous yellow, remainder fuscous and grey-dusted, second tergite sometimes with a faint brownish central mark, third and fourth each with two inconspicuous dark spots; abdomen of female with only the basal visible tergite testaceous yellow, the others fuscous, with lead grey dusting, and each with a pair of dark spots. Legs, including coxae, testaceous yellow. Wings hyaline, veins brown, yellow at bases. Calyptrae and halteres yellow.

Frons at vertex a little less than one third of the head width, widened anteriorly, and about 1.5 as long as its anterior width, ocellar bristles quite long; artista pubescent basally. Anterior pair of presutural dorsocentral bristles minute; both pairs of intra-alars distinct. Abdomen of male cylindrical; processes of fifth sternite in same sex narrower than in the *dexioides* group, not glossy, their apices narrowly rounded. Fore tibia without a median posterior bristle; mid tibia with a quite strong posterior bristle about one third from base (absent in two males); mid femur with one preapical posterior bristle; hind tibia with two anterodorsal and two posterodorsal bristles, no anteroventral bristle in either sex; hind femur with or without a fine preapical posterodorsal bristle. Inner cross vein a

little beyond middle of discal cell; ultimate section of fourth vein about twice as long as penultimate section.

Length, 3.5-4 mm.

Type and allotype, Lanihuli, Oahu, 2.9.1919 (J. C. Bridwell); paratypes, female, same locality as type, 5.25.1919 (O. H. Swezey); two females and one male, Palolo, Oahu (O. H. Swezey); one female, Olympus, Oahu, (O. H. Swezey); three females, Konahuanui, Oahu, (O. H. Swezey); and one male, same locality, July 23, 1916 (Timberlake).

The type male is the only one of that sex with a posterior mid tibial bristle.

Lispocephala striata (Grimshaw)

Frons brownish fuscous, with the orbits a little more greyish, antennae either similarly colored or the third segment yellowish brown, with base of that segment always yellowish; palpi testaceous yellow. Thorax fuscous, with anterior and posterior parts and sutures of pleura yellowish; dorsum grey dusted and with five brown vittae which are most distinct in female. Abdomen of male more or less broadly yellow at base, dorsum of second tergite and most of the surfaces of other tergites fuscous, shining, the abdomen of female is more extensively blackish, with only the apices of tergites yellowish. Legs yellow, tarsi fuscous.

Frons about one third of the head width, almost parallel-sided, and about 1.5 as long as wide; arista very short haired on basal half; third antennal segment fully three times as long as second. Both pairs of intra-alars distinct.

Length, 4-5 mm.

Localities, Waiawa, Oahu, 8.13.1916 (O. H. Swezey); Kaala Mts., Oahu, (O. H. Swezey, Timberlake, J. C. Bridwell); Lanihuli, Oahu, (E. H. Bryan, Jr.) About a dozen specimens in all.

The location of this species in key was indicated by Mr. F. W. Edwards from examination of the type specimen.

Lispocephala fusciseta sp. n.

Female.—Very similar to the preceding species, but the pleura, like the dorsum of thorax, is entirely fuscous and densely lead-grey dusted, the mesonotum having five fuscous vittae; the abdomen not entirely glossy, the tergites being grey dusted except on the paired black spots, and their apices are narrowly testaceous. Legs testaceous, tarsi but slightly darker. The outstanding structural differences between this species and *striata* lie in the form and armature of the legs. In *striata* the legs are more slender, and the fore tarsus is distinctly longer than the thorax, while in *fusciseta* the legs are quite stout and the fore tarsus is not as long as the thorax; the hind tibia in *fusciseta* has one anteroventral, two posterodorsal, and two anterodor-

sal bristles, all quite strong, while in *striata* the short basal bristle on anterodorsal and posterodorsal surfaces is usually absent or very weak.

Length, 5 mm.

Type, Kahuauli, Oahu, 7.16.1922 (E. H. Bryan, Jr.).

Lispocephala crassifemur sp. n.

Female.—Very similar to the two preceding species, but the frons is paler, with densely yellow dusted orbits and triangle, the latter extending to anterior margin of frons, the antennae are shorter and orange-yellow with a portion of upper margin of third segment brownish; the lower margin of humerus is yellowish; and though the abdomen is colored as is that of *fusciseta* the surface is more noticeably shining, and the apices of tergites more broadly testaceous. Legs testaceous.

In structure this species is most like *fusciseta*, the legs being quite stout and the fore tarsus not as long as thorax, but the mid tibia has the posterior bristle not close to middle but at about one-third from base, and the apical section of fourth vein is nearly twice as long as preapical section.

Length, 5 mm.

Type, Kaala Mts., Oahu (O. H. Swezey).

Lispocephala dispar (Grimshaw)

I have not seen this species, using Mr. Edwards suggestion as to its insertion in key from his examination of the type specimen.

Lispocephala oahuae sp. n.

Male.—Head fuscous, anterior margin of frons yellowish, all parts quite densely dusted, the interfrontalia blackish when seen from the side, but the entire frons silvery white dusted when seen from the front; face and cheeks white dusted, occiput greyish; antennae, palpi, and base of arista, yellow. Thorax fuscous, propleura and pleural sutures yellowish, the whole rather densely grey dusted, the dorsum darkest, slightly shining, and faintly vittate. Abdomen testaceous yellow, a large triangular mark on middle of second visible tergite, and remainder of tergites of apical half, except apex and lateral margins of third, black, and the whole surface shining and but faintly dusted. Legs testaceous yellow. Wings hyaline, veins yellow at bases. Calyptrae and halteres yellow.

Frons at vertex about one-third of the head width, a little narrowed at anterior margin, and about 1.5 as long as wide, triangle extending narrowly almost to anterior margin of frons; arista haired to middle, the longest hairs fully half as long as width of third antennal segment; eye facets quite noticeably enlarged in front. Anterior pair of presutural acrostichal bristles fully as long as anterior pair of presutural dorsocentrals and similarly situated; anterior pair of postsutural dorsocentrals not over one-third as long as second pair; both pairs of intra-alar bristles present; apical pair of scutellar bristles distinctly shorter than basal pair, and cruciate. Abdomen cylindrical; processes of fifth sternite chitinous, glossy, and broad, their apices rounded below, the fused central apical forceps of hypopygium curved backward apically, their upper or inner surface with some stiff black hairs. Fore

tibia without a median posterior bristle; mid femur with a long bristle near middle of posteroventral surface; mid tibia with a median posterior bristle; hind tibia with two posterodorsal, two anterodorsal, and two anteroventral, bristles, the lower anterodorsal and the preapical dorsal bristles each about half as long as tibia. Ultimate section of fourth vein twice as long as penultimate.

Length, 3.75 mm.

Type, Opaeula, Oahu, 3.30.1913 (O. H. Swezey).

The excessive reduction of the anterior pair of postsutural dorsocentrals, coupled with the noticeable reduction of the apical bristles, readily distinguishes this species from its allies.

Lispocephala flavobasalis (Grimshaw)

I have not seen this species, which is included in the key on data supplied by Mr. F. W. Edwards from an examination of the type specimen.

Lispocephala paloloae sp. n.

Male and female.—Head largely testaceous, densely brassy yellow dusted, the interfrontalia reddish in front, but almost obscured by dust in the male; antennae testaceous, third segment browned above in part; arista brownish; palpi testaceous. Thorax brownish or fuscous, but so densely yellowish dusted that it is impossible to distinguish the exact ground color, the humeri, propleura, and pleural sutures yellowish. Abdomen testaceous yellow, sometimes slightly darkened on part of dorsum, most of the tergites with a pair of round blackish spots, and between these anteriorly a paler central spot. Legs testaceous yellow. Wings greyish hyaline. Calyptrae and halteres yellow.

Frons at vertex a little less than one third of the head width, widened anteriorly, and nearly 1.5 as long as wide; ocellar bristles rather short; arista short haired to beyond middle, the longest hairs a little shorter than width of third antennal segment. Anterior presutural pair of dorsocentral bristles about half as long as posterior pair; both pairs of intra-alar bristles present. Abdomen of male subcylindrical, fifth sternite with blunt processes, superior fused forceps of hypopygium not recurved at apex, discal and apical bristles on tergites of apical half quite long and strong. Bristles of tibiae as in last preceding species. Ultimate section of fourth vein not 1.5 as long as penultimate.

Length, 4-4.5 mm.

Type, male, and allotype, Palolo, Oahu (E. H. Bryan, Jr.; J. C. Bridwell).

Lispocephala subvittata sp. n.

Male and female.—Head yellowish; frons fuscous, reddish in front; orbits, face, cheeks, and frontal triangle, yellowish grey dusted; occiput fuscous except on lower margin, grey dusted; antennae brownish yellow, third segment except base black; arista fuscous, brownish basally; palpi yellow;

proboscis black. Thorax black, densely grey dusted, dorsum with three fuscous vittae, which are not sharply outlined, and are fused in part on disc. Abdomen of male translucent yellow on basal two visible tergites, the other tergites fuscous, with dense grey dust except on lateral margins and the apical margin of third, which are yellow, first and second tergites each with a dorsal blackish triangle, largest on second, the next two tergites each with a pair of discal black spots which are almost fused; female with similar but larger black markings. Legs, yellow, female with all tarsi and almost the apical third of mid and hind femora blackened, male differing in having the bases of fore and mid tarsi yellowish, and the apices of mid femora less noticeably blackened. Wings hyaline.

Frons at vertex about one third of the head width, widened anteriorly, triangle extending to anterior margin; third antennal segment three times as long as second; arista haired to middle, longest hairs distinctly shorter than width of third antennal segment. Anterior presutural pair of dorsocentrals fully one third as long as the posterior pair; anterior pair of intraalars lacking or microscopic, posterior pair short; no fine hairs on sternopleura. Abdomen of male slightly compressed apically, tergites 3 and 4 each with apical and discal bristles in both sexes; processes of fifth sternite in male truncate at apices. Fore tibia without a median posterior bristle, the apical half of anterodorsal surface with rather distinct setulae; fore tarsus slender and normal in male; mid femur with three preapical posterior bristles; mid tibia with a median posterior bristle; hind femur with about 3 preapical posterior and one posteroventral bristles; hind tibia with two posterodorsal and anterodorsal bristles, the pair at middle longest, two short anteroventral bristles, and the preapical dorsal bristle about half as long as tibia. Ultimate section of fourth vein not over 1.5 as long as penultimate.

Length, 5 mm.

Type, male, allotype, and one female paratype, Glenwood, Hawaii, 3.2.1919 (O. H. Swezey).

This species appears to be very similar to *kauaiensis* (Grimshaw), but in the latter the arista is stated to be subplumose almost to tip, there is no mention of thoracic vittae in the description, and there is a mention of a large triangular shining blackish-brown spot on each anterior angle of first abdominal segment which is not present in the above species. From *triangulifera* (Grimshaw), which appears to be more closely similar in thoracic characters, the new species differs slightly in the color of abdomen, and more so in not having an incomplete blackish apical ring on hind femora. The hypopygial characters should provide evidence of specific distinctness here. It appears to me that the female described as that of *triangulifera* by Grimshaw is not that species.

Some New Species of Hawaiian Lepidoptera

BY EDWARD MEYRICK, Marlborough, England.

(Presented by O. H. Swezey at the meeting of December 1, 1927.)

The following notes and descriptions are made on some material kindly sent me for study by Mr. O. H. Swezey, and the types of the new species are desposited in the collection of the Hawaiian Entomological Society.

CARADRINIDAE

Euxoa Hübn.

This genus now includes most of the Hawaiian species formerly classed in *Agrotis*.

Euxoa xiphias (Meyr.).

Four examples, Kokee and Halemanu, Kauai, January to March (J. A. Kusche). All these are of the form with strongly developed black markings, which is apparently comparatively uncommon in the original Maui locality.

Euxoa charmocrita n. sp.

Male, female. 34-35 mm. Head ferruginous, transversely barred whitish. Palpi dark ferruginous-fuscous, apical hairs of second joint whitish or yellowish, tip of terminal whitish. Antennae male with acute triangular projections terminating in fascicles of cilia. Thorax red-brown mixed whitish dorsally, tegulae suffused whitish and internally edged black. Abdomen male light ochreous tinged rosy towards apex, female light greyish. Forewings elongate-triangular, costa nearly straight, termen rather obliquely rounded; rosy-brownish, mixed ochreous and whitish, especially along veins, veins forming fine dark lines; a black dot beneath base of costa; subbasal line irregular-dentate, black, terminated by a black submedian dash; first and second lines fine, dark fuscous, curved, first acute-dentate near costa and dorsum, second waved-dentate; median shade faintly darker, waved, angulated on reniform; spots dark fuscous or blackish, black-edged, orbicular oval, claviform somewhat larger, oval, resting on first line; reniform irregularly pentagonal, its lower posterior angle forming an acute projection, a small elongate blackish spot beneath this; some dark red-brown suffusion along costa beyond second line, with two or three minute whitish dots; subterminal line absorbed in groundcolour, but margined posteriorly by dark reddish-fuscous suffusion, especially in median and tornal blotches limiting two long teeth on veins 3 and 4; cilia pale brownish partially tinged whitish. Hind-

wings male whitish-grey, a grey postmedian line, female greyer; cilia paler or whitish-tinged.

Olokele Canyon and Kaholuamano, Kauai, February, April (J. A. Kusche); 2 examples. Allied to *E. xiphias.*

Agrotis stenospila n. sp.

Male, female. 40-45 mm. Head and thorax reddish-fuscous, on collar behind head an angulated blackish transverse streak suffused dark fuscous centrally in front, thorax sometimes mixed grey-whitish. Palpi dark brown. Antennae male with acute triangular projections terminating in fascicles of cilia. Abdomen greyish or pale greyish-ochreous. Forewings rather elongate-triangular, costa slightly arched, termen somewhat obliquely bowed; reddish-fuscous; subbasal, first, and second lines indistinct, faintly pale, obscurely and interruptedly darker-edged; spots obscurely indicated by darker outlines or partially finely blackish-edged, orbicular irregular, reniform quadrate, these approximated and connected by a small distinct blackish-fuscous spot, claviform semioval, resting on first line; subterminal line indicated by minute pale dots, hardly traceable; cilia light reddish-fuscous. Hindwings grey; cilia light grey, sometimes reddish-tinged.

Kokee and Kaholuamano, Kauai, January to March (J. A. Kusche); 3 examples. Perhaps nearest *A. chersotoides,* but quite distinct.

Aletia Hübn.

This genus includes those Hawaiian species referred by Hampson to *Cirphis.*

Aletia amblycasis (Meyr.).

Kokee and Kaholuamano, Kauai, January, April (J. A. Kusche); 3 examples.

Acrapex exanimis (Meyr).

Male, female. 22-24 mm. Head and thorax male whitish-ochreous. Female ochreous-whitish; head and tegulae with long fine rough hairs, in male a few dark hairs interspersed. Palpi whitish, male second joint dark grey above. Antennae male flat-dentate, ciliations under 1. Abdomen elongate, whitish. Forewings male triangular, female somewhat more elongate, termen faintly sinuate, male somewhat oblique, female rather more oblique; whitish-ochreous, minute scattered black specks, more numerous in male, interneural spaces tinged brownish-ochreous, especially in male; in male elongate patches of grey suffusion extending from angles of cell to termen and confluent on termen; black dots on fold at 2/5 and 3/4, and at 4/5 of disc between veins 5 and 6, in male distinct, in female minute or obsolete; cilia whitish-ochreous, on termen and tornus tinged grey and speckled dark grey. Hindwings and cilia ochreous-white.

Redescribed from 4 specimens (1 male, 3 female) bred from

larvae feeding in stems of *Panicum torridum* at Koko Head, Oahu (O. H. Swezey); the former description, taken from a single worn female (the only example then known), being inadequate for recognition. The species is confined to the Hawaiian Islands, but there are closely allied species in the Australasian region.

Plusiadae

Nesamiptis senicula n. sp.

Female. 39-40 mm. Head and thorax light fuscous irrorated white, frontal tuft long, thorax with small dense posterior crest. Palpi 3, brownish-grey, sprinkled darker and whitish. Forewings triangular, costa faintly sinuate, apex pointed, termen rather obliquely bowed; fuscous, suffusedly irrorated white, with obscure scattered dark fuscous strigulae; first line strongly curved, indistinct, second rather strongly sinuate inwards on lower half, space between these less irrorated whitish and towards second line strongly suffused dark fuscous, ground colour beyond this whiter-suffused; a small black dot in disc at 2/5; subterminal line fine, waved, whitish, obtusely angulated in middle and with a sinuate excavation below this, preceded by a fascia of fuscous suffusion darker posteriorly, and followed on costal third by a white triangular patch edged posteriorly with dark fuscous suffusion, and on dorsal half by whitish suffusion; a dark fuscous terminal line with blackish interneural dots; cilia fuscous with darker median shade or lines and whitish bars. Hindwings grey; a darker transverse mark on end of cell; a dark fuscous terminal line; cilia grey-whitish, one or two dark lines more or less expressed.

Kaholuamano, Kauai, April (J. A. Kusche); 3 examples. Allied to *N. obsoleta* but far larger, the second line more oblique on costa, the palpi (female) relatively shorter.

Nesamiptis proterortha n. sp.

Female. 27-28 mm. Head, palpi, thorax light fuscous irrorated whitish, palpi 3½. Forewings costa more sinuate than in *senicula*, apex less pointed; fuscous with scattered dark fuscous strigulae, irrorated white on basal area and costal half of median band; lower half of first line straight, oblique, black, upper half absent; a black discal dot beyond middle; second line straight, oblique, much nearer termen on costa than on dorsum, dark fuscous, preceded by dark fuscous suffusion except towards costa, and followed by a fascia of white irroration, on costa extending to apex; subterminal line indicated by a series of small dark fuscous spots angulated somewhat below middle, slightly sinuate on upper half, more deeply on lower; a darker terminal line and series of interneural blackish dots; cilia fuscous with darker lines, whitish bars hardly indicated. Hindwings rather dark grey; a dark fuscous terminal line; cilia whitish-grey, a fine dark fuscous subbasal and thicker median line.

Kaholuamano, Kauai, April (J. A. Kusche); 2 examples. Allied to *N. plagiota*, with first and second lines similar in form, but

distinguished by quite different sub-terminal line. Although associated in time and place with the preceding, this is entirely distinct; all four species of the genus are found in Kauai, probably therefore its original home.

Cosmophila vulpicolor n. sp.

Male, female. 38-42 mm. Head and thorax brown-reddish, light dull crimson, or ochreous-yellowish. Palpi deep dull crimson, second joint sometimes yellow-tinged. Antennae male shortly dentate, ciliated and with a longer bristle on each tooth. Anterior legs wholly deep dull crimson. Forewings rather elongate-triangular, apex pointed, termen somewhat oblique, rounded-bent in middle, slightly sinuate on upper half, straight on lower; rather deep brown-reddish, or in one specimen yellow-ochreous, more or less obscurely strigulated paler and darker; first line obscurely darker, only traceable between cell and lb; orbicular obsolete; reniform indicated by two transversely placed blackish or dark grey dots, connected by a slightly curved fine indistinct darker line; second line darker, sometimes tinged grey, posteriorly well-defined and faintly pale-edged, on upper half excurved and irregularly waved, on lower half quite straight; sometimes an irregular subterminal series of faint cloudy greyish spots or dots; terminal edge suffused darker; cilia concolorous with wing, tips pale, sometimes faint greyish bars. Hindwings light dull greyish-rosy, in the ochreous example pale rosy-ochreous; cilia pinkish-grey-whitish.

Manoa, near Honolulu, Oahu, 4 reddish examples bred August from larvae on *Osteomeles anthyllidifolia* (F. X. Williams); Wailupe, Oahu, a single yellow example bred from unknown food-plant (J. C. Bridwell), but certainly conspecific. Allied to the widely distributed *fulvida* Guen., which has the anterior tibiae and first joint of tarsi white.

Hydriomenidae

Hydriomena leucoxyla (Meyr.).

Male, female. 30-36 mm. Kaholuamano and Kokee, January to April (J. A. Kusche); 8 examples. Originally described from a single female (also from Kauai), which in the absence of the male was referred to *Xanthorhoe,* being indeed very like the European *X. montanata;* the discovery of the other sex shows that it is a typical *Hydriomena,* of which genus there is as yet only one other Hawaiian species.

Selidosemidae

Scotorythra crocorrhoa n. sp.

Female. 30-38 mm. Head and palpi ochreous-orange, neck sometimes white. Thorax light ochreous-orange. Abdomen light ochreous-orange,

sides and apex sometimes whitish. Forewings triangular, apex pointed, slightly prominent, termen slightly bowed, somewhat oblique; 11 usually anastomosing with 12; light ochreous-orange, finely strigulated light grey; first and second lines formed by series of grey dots on veins, sometimes faint or almost obsolete, first slightly curved, second curved outwards in median area, somewhat sinuate beneath this; median shade faintly greyish or hardly perceptible, nearly straight; cilia light ochreous-orange, sometimes faintly greyish-tinged, tips whitish. Hindwings as forewings, but all lines obsolete, termen gently waved.

Kokee and Olokele Canyon, Kauai, January, February (J. A. Kusche); 12 examples. Next *arboricolans,* but easily distinguished from all its allies by colour; unfortunately no male was taken.

Pyraustidae

Hydriris Meyr.

Hydriris exaucta n. sp.

Male, female. 27-33 mm. Head pale greyish-ochreous suffused blackish except collar. Palpi blackish. Thorax greyish-ochreous sprinkled blackish. Abdomen male very long. Forewings elongate-triangular, termen very obliquely bowed; light brown irrorated dark fuscous; first line obscure, dark fuscous, angulated in middle; orbicular and discal spots irregularly 8-shaped, dark fuscous, partially pale-edged, centrally tinged grey, discal larger; second line very oblique, blackish, irregularly dentate, somewhat prominent in middle and slightly sinuate on lower half, separated by a narrow dark grey fascia from the irregularly dentate ochreous-whitish subterminal line; four small dark grey spots on costa posteriorly separated by whitish; a whitish terminal line spotted dark fuscous; cilia ochreous-whitish barred fuscous, a fuscous basal shade. Hindwings as forewings, but orbicular hardly perceptible, discal round, blackish, ringed whitish.

Kaholuamano and Kokee, Kauai, January to April (J. A. Kusche); Halehaku, Maui, June (E. H. Bryan). 6 examples. A true *Hydriris,* much larger than either of the other species of the genus; an interesting discovery.

Tortricidae

Spheterista Meyr.

(Exotic Microlepidoptera, I, p. 2, 1912.)

Spheterista pleonectes (Walsm.).

Glenwood, Hawaii, one example bred March from *Cheirodendron* (O. H. Swezey).

Spheterista asaphopis n. sp.

Male 15 mm., female 17-21 mm. Head and palpi ferruginous-brown, face sometimes pale ochreous. Antennal ciliations male ½. Thorax ferruginous-brown, usually a pale ochreous anterior bar, seldom dorsally suffused pale ochreous or infuscated. Forewings moderate, somewhat narrowed posteriorly, male rather short, female more elongate, costa moderately arched anteriorly, male with strong fold from base to near middle; in the single male dull ferruginous-fuscous, coarsely strigulated darker, in female ferruginous-ochreous, pale ochreous, or ferruginous-whitish, more or less darker-strigulated, in one example strewn with dark ferruginous-fuscous strigulae; in male a blackish tuft near base beneath costal fold; some small dark fuscous spots or dots along costa; dorsum with dark or blackish dots separated by whitish dots; basal patch more or less brown-suffused, ill-defined, posterior edge in male traversed by a rather inwards-oblique white shade broader towards costa, in one female marked on dorsum with a ferruginous-blackish spot; central fascia ill-defined, more or less suffused light purplish-fuscous or brown, oblique, irregular-edged, considerably dilated on lower half; some dark strigulation or striae before termen, in male an apical blotch of white suffusion including an irregular blackish-fuscous spot; cilia light ferruginous-brown, sometimes mixed whitish. Hindwings grey, faintly darker-strigulated; cilia grey-whitish, a grey subbasal shade; undersurface whitish, scattered grey strigulae.

Mt. Kaala, Kaumuohona, Palolo, Oahu, bred May from *Cheirodendron Gaudichaudii* (O. H. Swezey); 7 examples. Though allied to *pleonectes* and *variabilis,* certainly distinct by the much shorter ciliations of male antennae (in both those species slightly exceeding 1). One female example has veins 7 and 8 of forewings unusually long-stalked, 9 absent, and 7 of hindwings absent; abnormalities of this class are probably due to some accidental pressure in the pupa stage.

Eulia Hübn.

The species placed by Lord Walsingham in *Archips,* I refer to *Eulia;* no species of *Cacoecia* (=*Archips* Wals.) has been found in Hawaii.

Eulia dermatopa n. sp.

Male, female. 18-20 mm. Head, palpi, and thorax male dark brown, female pale brownish-ochreous, thoracic crest dark brown. Antennae male indistinctly subdentate, ciliations under ½, towards base longer but less than 1. Abdomen light grey. Forewings suboblong, costa anteriorly moderately arched, male with narrow fold on basal third, termen rather oblique; male brown or light brownish, more or less marked with dark brown transverse striae accompanied by dark fuscous irroration, female pale brownish-ochreous; basal patch large, edge irregular, oblique, in male mostly merged in the general darker colouring, in female brown except towards

costa and at extreme base; central fascia very irregular-edged, towards costa moderate, on lower 2/3 much broader, in male more or less distinctly outlined with dark striae, in female brownish, lighter towards costa, sometimes suffusedly confluent with basal patch in disc; about eight small dark fuscous spots on costa; some dark fuscous dots on dorsum; in female usually two series of minute dark fuscous dots towards termen; cilia light ochreous to whitish-ochreous, round apex and costa barred blackish or dark fuscous. Hindwings whitish-grey, suffusedly spotted or strigulated grey; cilia whitish-grey.

Olympus and Tantalus, Oahu, bred January, April, May from *Suttonia lessertiana* (O. H. Swezey). A larger female (23mm.), with basal patch and central fascia quite obsolete, bred April from *Suttonia*, Olympus, may perhaps be the same species.

Eulia notocosma n. sp.

Male. 18 mm. Head pale brownish-ochreous, crown more brownish. Palpi brownish-ochreous. Antennae filiform, ciliations ½. Thorax ochreous-brown, a large ochreous-white dorsal blotch anteriorly rounded and edged dark fuscous extending from near anterior margin to dark fuscous posterior double crest, apical half of tegulae white. Abdomen white, faintly greyish-tinged towards apex. Forewings suboblong, costa anteriorly moderately arched, costal edge slightly raised towards base but without developed fold, termen somewhat oblique; pale yellow-ochreous, veins posteriorly deeper ochreous; basal patch large, ferruginous-ochreous, edge irregular, oblique, costal edge dark fuscous dotted black; upper half of central fascia brown mixed dark fuscous, united with a similar inwards-oblique fasciate streak from costa at ¾ to form a triangular patch enclosing an ochreous spot on costa in which is a small dark fuscous costal spot, lower half of central fascia lighter brown, broadly expanded on both sides in disc, but narrowed towards dorsum; three or four small dark fuscous spots on costa towards apex, and some dots on dorsum; cilia light brownish-ochreous, barred dark fuscous on costa and apex, some basal dots on termen. Hindwings white, only two or three faint greyish spots in disc posteriorly; cilia ochreous-white.

Female. 24 mm. Thorax whitish-ochreous, a broad antemedian bar on back and posterior crest dark brown. Forewings with a small ferruginous-ochreous and brown spot before middle of termen. Hindwings faintly spotted light grey on terminal half. Otherwise as male.

Olympus, Oahu, 2 male examples bred January from *Suttonia lessertiana*, 1 female bred April from *Astelia veratroides* (O. H. Swezey); these are unquestionably sexes of the same species. Easily recognized by the white hindwings and peculiarly adorned thorax, also by absence of costal fold in male.

Eulia pycnomias n. sp.

Male. 18-20 mm. Head light brownish-ochreous. Palpi yellow-ochreous. Antennae indistinctly subdentate, ciliations ½, longer towards base but

under 1. Thorax dark brown, a dark fuscous angulated antemedian bar, posterior crest double dark fuscous, apex of tegulae expanded with dense rough scales. Abdomen white. Forewings suboblong, costa anteriorly moderately arched, with slender fold on basal fourth, termen somewhat oblique; brownish-ochreous, sometimes some indistinct scattered greyish strigulae; costal fold dark fuscous dotted black, basal patch indicated by a short oblique streak of ferruginous-brown suffusion towards costa only; a subtriangular dark brown patch mixed purplish-grey extending on costa from 2/5 to 4/5 and reaching half across wing, its apex truncate; median area of dorsal edge white dotted black; cilia brownish-ochreous. Hindwings white, three or four small cloudy grey spots in disc posteriorly; cilia white, towards base yellowish-tinged.

Wailupe, Oahu, bred January from *Suttonia lessertiana* (O. H. Swezey); 2 examples. Distinct by white hindwings, dark brown thorax, and especially the tufted tegulae. The empty pupa-shells sent are peculiarly white and transparent.

Eulia chlorippa n. sp.

Male. 18 mm. Head and palpi dark fuscous, slightly mixed ochreous-whitish. Antennae distinctly dentate, cilia 1/2, toward base becoming over 1. Thorax dark fuscous, obscurely spotted pale ochreous. Abdomen whitish-grey, whiter at base. Forewings rather broad, costa rather bent before middle, with narrow fold from base to 2/5, termen somewhat oblique, whitish-ochreous, a few very minute scattered blackish dots; costal fold ochreous, sprinkled and dotted black; a wedgeshaped fuscous blotch along costa from before middle to 4/5, spotted blackish on costa, beneath with an attached black mark from anterior angle and small spot on end of cell, beneath first of these a connected irregular black spot centred fuscous and followed by a black dot; cilia whitish-ochreous, round apex barred fuscous. Hindwings grey-whitish, strewn with small grey spots and strigulae; cilia white.

Olympus, Oahu, bred April from *Suttonia lessertiana* (O. H. Swezey); 1 example. Broader-winged than the other species, with longer antennal ciliations, and conspicuously pale ground-colour, which (though really ochreous) appears whitish to the eye.

Eucosmidae

Adenoneura conspicua (Wals.)

Male, female. 14-19 mm. Tantalus, Kahauiki, Sugarloaf Hill, Oahu, bred September to November from seeds and decaying bark of dead *Acacia koa* (Swezey, Hadden); 16 examples. Placed by Walsingham (who did not know the male) in *Enarmonia;* his example was from Maui.

Aristotelia compsodelta n. sp.

Male, female. 11-13 mm. Head white, sometimes slightly speckled grey or fuscous. Palpi white, base or basal half and usually a subapical ring on second joint, and basal, median, and apical rings on terminal joint more or less developed dark fuscous. Thorax whitish, sometimes slightly speckled fuscous, shoulders dark fuscous. Forewings with apex obtuse-pointed, termen very obliquely rounded, 2 from about 3/4, 6 separate; white, more or less closely irrorated fuscous or dark fuscous; a wedge-shaped dark fuscous spot on base of costa; a large blackish-brown triangular blotch occupying nearly median third of costa, edged clearer white, its apex more or less ferruginous and almost reaching dorsum; a semioval blackish-brown spot in disc at 3/4; cilia greyish or whitish, base within a fine blackish subbasal line grey dotted white. Hindwings and cilia light brownish-grey.

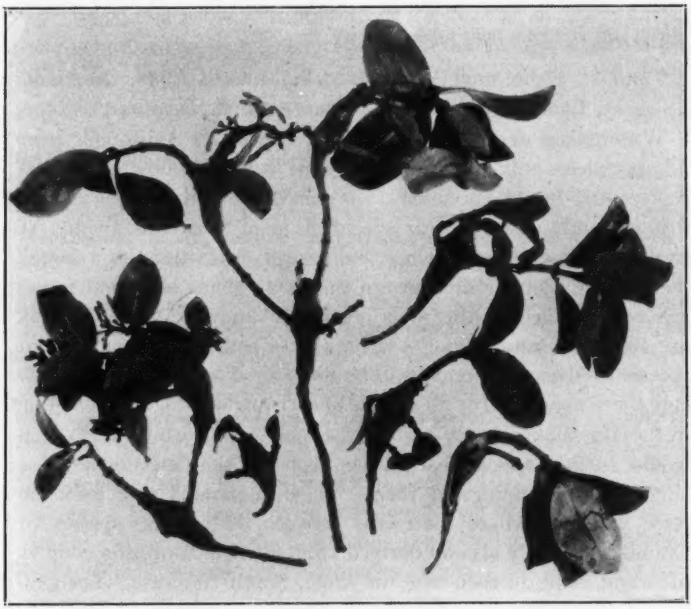
Tantalus, Oahu, bred August from capsules of *Kadua acuminata* (Swezey, Lyon); 10 examples. Nearest to *A. elegantior*.

Walsingham described 9 Hawaiian species of Aristotelia from 17 specimens only, all captured. The 6 species now added are represented by 44 specimens, all reared from the larvae; hence it is evidently easier to rear specimens than to capture them. All have the same form of wing and neural characteristics (though there is considerable diversity in this large genus elsewhere), and are nearly allied to the nine previously known; and as all six are from the same island, I infer that a considerable number of species of the genus remain to be discovered in the group; probably there may be 40 or 50 species of Aristotelia altogether existing in the Hawaiian islands. From their close conformity of type it would further appear that all are probably the descendants of a single original immigrant form. If so, a parallel case exists in New Zealand, where there are between 40 and 50 species of Crambus probably also all derived from a single form, the country of origin being in each case the same, South America. The geological date of the New Zealand immigration is inferred to be early Tertiary, and if an equivalent rate of development be assumed in each case (which is not unreasonable, the circumstances being very similar) an approximate date is obtained for the Hawaiian introduction, where no geological data are available. Using this as a standard, some idea can be formed of the geological age of other important Hawaiian genera; thus, on the hypothetical formula that the period of time since the introduction of a genus is in

direct ratio of the square root of the number of indigenous species, and supposing that the number of species of Hyposmocoma is 300 (a probable estimate, over 200 being already known), we should find the relative ages of Aristotelia and Hyposmocoma to be in the proportion of 7 to 17.

Aristotelia xylospila n. sp.

Male, female. 14-19 mm. Head pale greyish-ochreous to fuscous. Palpi with second joint blackish with whitish apex, terminal joint whitish with blackish basal or subbasal, median, and apical rings. Thorax varying from



Stem galls on Gouldia caused by *Aristotelia xylospila.*

whitish-fuscous to fuscous, sometimes dorsally and anteriorly suffused blackish. Forewings fuscous, more or less suffusedly irrorated white, more or less strewn with small blackish dots or strigulae; basal area irregularly mixed blackish; an indistinct narrow direct whitish fascia at 1/4, followed by a dark brown trapezoidal blotch from costa reaching fold; second and sometimes first discal stigma distinct, dark fuscous; a small dark fuscous apical spot, and sometimes dots or small spots on posterior part of costa and ter-

men; cilia pale greyish, basal half round costa and termen barred alternately blackish and white irroration. Hindwings dark grey; cilia grey.

Mount Kaala, Oahu, bred from large galls on new stems of *Gouldia coriacea* (O. H. Swezey); 8 examples.

Aristotelia homoxyla n. sp.

Male, female. 12-19 mm. Head light greyish-ochreous to fuscous. Palpi ochreous-whitish, variably ringed or more generally suffused dark fuscous, varying from having only base of second joint dark fuscous to total suffusion of palpus except apex of second joint. Thorax fuscous to dark fuscous. Forewings more or less light ochreous-brownish suffusedly irrorated white, strewn with small dark brown strigulae; base more or less narrowly suffused dark fuscous; a dark brown triangular blotch from costa before middle reaching to fold, edged anteriorly by a more or less expressed oblique fascia of white suffusion extended to dorsum; second discal stigma moderate; distinct, dark brown, first present only in one example; cilia ochreous-whitish, base spotted fuscous. Hindwings grey; cilia pale ochreous-greyish.

Pauoa and Kaumuohona, Oahu, bred February, May, July from galls on stems of *Gouldia coriacea* (O. H. Swezey); 11 examples. Very similar to the preceding, which feeds on the same plant in the same way, but certainly distinct.

Aristotelia multiformis n. sp.

Male, female. 9-15 mm. Head, palpi, and thorax whitish-ochreous or light reddish-ochreous to fuscous and dark fuscous, terminal joint of palpi sometimes whitish with darker rings. Forewings whitish-ochreous or light reddish-ochreous, irregularly mottled and strigulated ferruginous or dark reddish-fuscous; sometimes an irregular slender oblique dark streak from costa at 2/5 to fold, in the darkest specimen becoming a rhomboidal blackish blotch terminated beneath with ferruginous; cilia pale reddish-ochreous (in the darkest specimen light grey except on termen), base spotted reddish-fuscous or blackish. Hindwings and cilia from ochreous-whitish to light grey.

Punaluu, Konahuanui, Tantalus, and Olympus, Oahu, bred January to March, August, September from mines in leaves of *Gouldia coriacea* (O. H. Swezey); 8 examples. Very variable in colouring, but doubtless all conspecific. Next to *A. mendax*.

Aristotelia gratula n. sp.

Female. 12 mm. Head and thorax whitish-ochreous, face white. Palpi white, subapical band of second joint, and extreme base and supramedian band of terminal joint ochreous speckled dark fuscous. Forewings white partially speckled light reddish-grey, with scattered strigulae of fine black irroration; basal area light ferruginous-grey except towards costa; a triangular dark fuscous antemedian blotch from costa to fold, its lower part suffused ferruginous, apex truncate, some dark irroration occupying dorsal area beneath and beyond this; a small oval ferruginous spot speckled blackish

in disc beyond middle, and a rather larger one (second discal stigma) at 2/3; two small suffused dark fuscous spots on costa towards apex; some darker irroration towards termen; cilia grey, round apex tinged ferruginous, base indistinctly darker-barred. Hindwings grey; cilia light grey.

Olympus, Oahu, bred January from mine in leaf of *Straussia kaduana* (O. H. Swezey); 1 example.

Aristotelia thurifica n. sp.

Male, female. 8-9 mm. Head and thorax ochreous-whitish to violet-ochreous, sometimes speckled grey. Palpi whitish, second joint usually suffused dark ochreous-grey except apex, terminal joint sometimes with dark ochreous-grey median band. Forewings violet-ochreous, strewn with dark fuscous strigulae; plical and second discal stigmata sometimes faintly traceable as small ferruginous-brown spots; usually no other definite markings, but in one specimen a flattened-triangular ferruginous-brown median costal blotch connected with a spot on dorsum beyond middle, these preceded by white suffusion extended along costa to a very irregular oblique ferruginous-brown streak from base of costa to fold, base of wing white beneath this; posterior area of wing suffusedly mixed white irroration except second discal stigma and margins; cilia light grey, sometimes a darker antemedian shade, or base pale ochreous barred dark brown. Hindwings and cilia grey.

Tantalus and Palolo, Oahu, bred December and January from mines in leaves of *Kadua acuminata* (O. H. Swezey); 6 examples.

DIPLOSARIDAE

Hyposmocoma jugifera n. sp.

Male. 16-18 mm. Head whity-brownish, face more whitish. Palpi whitish, terminal joint suffusedly lined blackish on each side anteriorly. Thorax pale brownish. Forewings light brownish, with scattered black specks; blackish dots on base of costa and dorsum; some fuscous suffusion along dorsum from a small blackish spot at 1/4 to tornus, lighter posteriorly; stigmata moderate, black, discal connected by a strong black streak, plical slightly before first discal; a suffused fuscous patch occupying apex and upper half of termen; cilia ochreous-grey-whitish, basal half barred dark fuscous, apical bar extending to tips. Hindwings grey; cilia pale grey.

Tantalus and Niu, Oahu, bred August from dead branch of *Acacia koa* (F. X. Williams, O. H. Swezey); 2 examples. Perhaps nearest *H. ocellata.*

Hyposmocoma erismatias n. sp.

Male 15 mm., female 18 mm. Head and thorax ochreous-white, tegulae dark brown. Palpi white, base and tip dark fuscous. Forewings ochreous-white; a moderate median streak of brown suffusion from base to end of cell, at base reaching costa, edged beneath by a slender black streak from base terminating in plical stigma, which is rather obliquely before first discal; discal stigmata moderate, irregular, black, within or just above median

streak; a marginal series of black dots round posterior fourth of costa and termen; cilia whitish, at apex a brown bar. Hindwings light grey; cilia ochreous-whitish.

Nuuanu, Oahu, bred October from dead stem of *Euphorbia* (J. C. Bridwell); 2 examples.

Hyposmocoma chilonella Wals.

Olinda and Iao Valley, Maui, 14 examples bred February and March from dead wood of *Cheirodendron, Rubus, Acacia, and Aleurites* (O. H. Swezey).

Hyposmocoma insinuatrix n. sp.

Male. 17-18 mm. Head and thorax dark purplish-bronzy-fuscous. Palpi lilac-fuscous, terminal joint whitish. Forewings dark purplish-fusccus; a straight white line from middle of base along fold to tornus, thence along termen to apex; cilia light grey, on costa fuscous. Hindwings bluish-grey; cilia whitish-ochreous-grey.

Kainalu, Molokai, 2000-3000 feet, bred July from dead wood of *Smilax sandwicensis* (O. H. Swezey); 2 examples. Next *continuella,* which has a whitish head and broader stripe.

Hyposmocoma chloraula n. sp.

Male, female. 18-20 mm. Head and thorax light brownish. Palpi light brownish-ochreous. Forewings dark fuscous; costal and dorsal edge brownish-whitish from base to 3/4; all veins marked with cloudy brownish-white lines, those above and below submedian fold anteriorly suffused and forming thicker streaks; cilia ochreous-whitish, towards base indistinctly barred brownish. Hindwings pale whitish-grey; cilia whitish-grey-ochreous.

Summit Camp, Kauai, bred April from dead stem of *Astelia* (O. H. Swezey); 2 examples. In one of these vein 9 of forewings rises out of 8 near base, in the other separate as usual.

Hyposmocoma caecinervis n. sp.

Male, female. 16-20 mm. Head and thorax brown. Palpi ochreous-whitish. Forewings ochreous-brown, sometimes pale-streaked between veins, costal edge obscurely pale; veins marked with fine dark fuscous lines; discal stigmata linear, blackish, sometimes obsolete; a more or less distinct pale ochreous streak along fold; cilia varying from light brownish to fuscous. Hindwings pale greyish; cilia whitish-grey.

Mount Kaala, Oahu, bred January from dead stems of *Smilax sandwicensis* (J. C. Bridwell); 3 examples. Allied to *malacopa* and *chloraula.*

Hyposmocoma palmivora n. sp.

Female. 16-18 mm. Head ochreous-whitish, crown posteriorly more or less suffused ferruginous, sidetufts sometimes mixed dark fuscous. Palpi ochreous-whitish, more or less sprinkled dark fuscous, second joint rough beneath except toward base, terminal joint somewhat shorter. Antennae whitish ringed dark fuscous. Thorax whitish-ochreous variably tinged or suffused ferruginous. Forewings whitish-ochreous more or less wholly suffused ferruginous, sprinkled dark fuscous; large erect scale-tufts beneath fold at about 1/5 and middle of wing; discal stigmata forming dark spots, sometimes blackish-mixed surrounded by more or less developed pale rings, plical similar or not traceable, slightly beyond first discal, sometimes confluent with it; beyond second discal an oblique darker fascia, edged posteriorly by a whitish-ochreous streak; cilia whitish-ochreous tinged rosy, basal half with bars or blackish irroration. Hindwings ochreous-whitish-grey; cilia whitish-ochreous.

Eight examples, Kumuwela, Kauai, 4000 ft., bred August from larvae "feeding amongst the abundant yellowish cottony tomentum on underside of the leaves of the native palm *Pritchardia eriophora*, particularly between the folds of the leaf" (O. H. Swezey).

Gracilaridae

Parectopa Clem.

The Hawaiian species placed by Walsingham in Gracilaria belong properly to Parectopa, well represented in America.

Parectopa sciallactis n. sp.

Male, female. 4.5-6 mm. Head and thorax white or grey-whitish. Palpi white, sometimes with fuscous rings at apex of second joint and in middle of terminal. Antennae white ringed fuscous. Forewings light ochreous-yellowish, sometimes partially suffused light greyish; markings pearly-white or sometimes greyish, edged with fine rows of black scales; a short median line from base meeting apex of an oblique spot from dorsum near base; three very oblique streaks from costa, first continued along costa to base, first and third meeting oblique spots from dorsum to form acutely angulated fasciae, second reaching half across wing; a short direct white mark from costa towards apex; a suffused white apical patch, containing a black apical dot; cilia whitish or grey-whitish, with two black lines. Hindwings grey; cilia whitish.

Seven examples, Kaena Point, Oahu, reared November from mines "in fleshy leaves of *Lipochaeta integrifolia*, growing in rocky places near the seashore" (O. H. Swezey). The markings, though often quite clear, are sometimes confused and partly obliterated by the grey suffusion.

Thysanoptera of the Hawaiian Islands

BY DUDLEY MOULTON
San Francisco, California.

(Presented by O. H. Swezey at the meeting of June 2, 1927.)*

Our knowledge of the Thysanoptera from the Hawaiian Islands has been largely based on Mr. R. S. Bagnall's excellent paper published in 1910 (Fauna Hawaiiensis, Vol. III, Part VI) and with some additions made by Mr. Kirkaldy (Kirkaldy, 1907, Proc. Haw. Ent. Soc., 1, p. 102) and Mr. A. C. Morgan (Proc. Nat. Mus. Vol. 46, No. 2008, p. 3). Many years ago Mr. D. T. Fullaway sent me a number of specimens which have never been reported on and Messrs. O. H. Swezey, F. X. Williams and W. M. Giffard have recently added many new collections. I am presenting in this paper a report of the specimens now before me, with listings of species recorded by other writers, making this a complete record of all known species from the Hawaiian Islands. Several of Bagnall's species listed under *Dolerothrips* will probably later be referred to the genus *Hoplothrips* but I am here listing them under the original genus as I do not have specimens for study. I wish here to express my deep appreciation to Messrs. Fullaway, Swezey, Williams and Giffard for their cooperation in making collections of thrips for me to study.

TEREBRANTIA

Family AEOLOTHRIPIDAE

Aeolothrips fasciatus (Linn.) 1761

A single ♀ specimen collected by Mr. O. H. Swezey on *Cyathodes Tameiameiae* at Haleakala, Maui, at an elevation of 6000 feet, on June 15, 1927. This is the first record of the genus *Aeolothrips* being found in the Hawaiian Islands. (Moulton No. 2543.)

* Substantial additions were made to this paper subsequently from material received at later dates. [EDITOR.]

Family THRIPIDAE Subfamily HELIOTHRIPINAE Karny

Heliothrips haemorrhoidalis Bouche 1833

Five ♀ specimens, two dark colored and three with abdomen light yellowish color. Collected from *Croton* leaves at Honolulu, *Fuschia, Metrosideros polymorpha* and other plants in the region of Kilauea volcano, Hawaii, at an elevation of 3000-4000 feet in February, March and September, 1927, by Messrs. O. H. Swezey and W. M. Giffard. (Moulton Nos. 1819, 1855.)

Subfamily CHIROTHRIPINAE Karny

Limothrips cerealium Halid. 1836

(Previously recorded by Mr. R. S. Bagnall in Fauna Hawaiiensis, III, pt. VI, p. 701, 1910.)

Chirothrips mexicanus Crawf. 1909

Nineteen ♀ and three ♂ specimens collected on *Chloris paraguayensis* February 22, 1927, at Koko Head, Oahu; on *Eragrostis variabilis* March 13, 1927, at Waimanalo, Oahu and on *Eragrostis* (heads) April 10, 1927, at Kolekole Pass, Oahu. All collections made by Mr. O. H. Swezey.

The female of this species was originally collected in Mexico and described by Mr. D. L. Crawford, and later it was found in the West Indies. This record now extends its distribution to the Hawaiian Islands.

The male is described as follows:

Color: Head and thorax light brownish yellow with head shaded a little deeper brown; abdomen brown, first segments lighter, terminal segments darker. Antennal segments one, two and three light brownish yellow with one and three slightly darker, four brown, five to eight dark brown. Fore legs yellow except blackish brown spot at end of tarsi, middle and hind femora and tibiae dark brown, femora shading lighter at base, and tibiae lighter at tip, tarsi yellow.

Total body length .8 mm.; head length, .09 mm., width .093 mm.; prothorax length .170 mm., width .201 mm.; pterothorax width .22 mm. Segments of antennae: length (width) I, 24 (39); II, 21 (30); III, 21 (24); IV, 24 (27); V, 18 (20); VI, 24 (15); VII, 11; VIII 9; total length 150 microns. Longest spines on posterior angles of prothorax 21 m., other spines on head and thorax vestigial.

Head, antennae, prothorax and fore legs shaped as in the female. Ocelli absent. Mouth cone short, reaching to near middle of prosternum. Wings absent. Abdominal sternites without evidence of ventral depressions.

Described from three ♂ specimens. Allotype in author's collection, one paratype deposited in the collection of the Hawaiian Entomological Society, Honolulu. (Moulton Nos. 1813, 1816 and 1822.)

Subfamily SERICOTHRIPINAE Karny
Tribe ANAPHOTHRIPINI Pr.

Anaphothrips (Chaetanaphothrips Pr.) **orchidii** (Moulton), 1907

A single ♀ specimen of this thrips was collected by Mr. F. X. Williams on *Commelina nudiflora,* Mt. Tantalus, Oahu, December 12, 1926. (Moulton No. 1443.)

Anaphothrips (Anaphothrips) swezeyi n. sp.

Female holotype: Color: body and legs uniformly light yellow to brownish yellow; antennal segments one, two, three and basal half of four yellowish, three shaded gray brown in outer third and four darker gray brown in outer half, five grayish yellow in basal third, dark brown in distal two-thirds, six to eight dark brown, six sometimes light at extreme base. Ocelli with deep orange-red crescents. Tip of mouth cone dark brown. Fore wings with scale light brown, a distinct though not clearly defined light brown cloud along anterior vein which is broader near base. gradually becoming narrower until it fades completely just past middle of wing; a dark cloud along posterior vein beginning near basal quarter of wing and fading completely near distal quarter, tip of wing clear.

Total body length 1.00 mm.; head length .10 mm., width .12 mm.; prothorax length .10 mm., width .13 mm.; mesothorax width .18 mm. Segments of antenna: length (width) I, 15 (24); II, 30 (24); III, 36 (18); IV, 33 (18); V, 36 (15); VI, 45 (15); VII, 9; VIII, 9; total length 225 microns.

This species is closely related to *A. obscurus* Muller, so a detailed description would hardly be necessary here. It may be separated from *obscurus* by its smaller and more slender body, and also by the coloring of the antennae and wings. There are no prominent spines on head or prothorax, while the wing spines are similar in number and arrangement to *obscurus.* The mouth cone reaches to near posterior margin of prothorax. Wings extend to eighth abdominal segment, and veins of the fore wings are indistinct, while in *obscurus* they are prominent and darker colored. Comb along posterior margin of segment eight well-developed.

Described from fifty-nine ♀ specimens taken on *Chaetochloa verticillata* and on *Panicum torridum* by Messrs. O. H. Swezey and F. X. Williams at Honolulu, T. H. Holotype in author's collection, paratype deposited in the collection of the Hawaiian Entomological Society, Honolulu. (Moulton Nos. 1448, 1818 and 2554). I take pleasure in naming this species after one of the collectors, Mr. Swezey.

Subfamily THRIPINAE

Scolothrips sexmaculatus (Pergande), 1894

(Previously recorded by Mr. R. S. Bagnall in Fauna Hawiiensis, III, pt. VI, p. 700, 1910).

Frankliniella flavens n. sp.

Female holotype: Color: body and legs clear light lemon yellow with pterothorax a little darker. Antennal segment one whitish, two to five light yellow with a slight tinge of brown in the outer portions, six brownish yellow in basal third, abruptly dark brown in distal two-thirds, seven and eight dark brown. Crescents of ocelli deep orange red. Mouth cone tipped with black.

Total body length 1.06 mm.; head length .105 mm., width .150 mm.; prothorax length .135 mm., width .174 mm.; pterothorax width .224 mm. Segments of antenna: length (width) I, 21 (30); II, 33 (24); III, 51 (18); IV, 45 (18); V, 42 (18); VI, 54 (18); VII, 12; VIII, 15; total length 285 microns. Length of spines, interocellars 36 m., postoculars 30 m., on anterior margin of prothorax 30 m., on anterior angles 45-54, on posterior angles subequal 75, on ninth and tenth abdominal segments subequal 120 microns.

Head clearly transverse, almost one-third wider than long, apex rounded; cheeks almost straight and parallel. Interocellar spines rather long, placed in front of and inward from each posterior ocellus, postoculars shorter. Eyes and ocelli normal, eyes occupying about two-fifths the sides of the head. Mouth cone long and pointed, reaching beyond the posterior margin of prosternum. Antennae slender approximately two and one-half times as long as head; sense cones normal, pedicel of third antennal segment without abrupt sub-basal thickening, (*intonsa* group).

Prothorax clearly transverse and .25 wider than long, slightly wider than head, spines well developed. A series of five spines along posterior margin uniformly small and inconspicuous except only the fourth which is strong and fully two and one-half times longer than the others. Pterothorax normal. Legs normal. Wings fully developed, reaching to near tip of abdomen, fore wings with spines as follows: costa 21-24, fore vein 21-22, hind vein 15-17, scale with five spines along outer margin and a sixth one near base on inner margin. Abdomen normal, comb along posterior margin of segment eight fully developed but sparse, tenth segment with dorsal suture.

Male allotype: Color uniformly clear light lemon yellow excepting only distal two-thirds of sixth antennal segment and seventh and eighth which are abruptly dark brown. Ocelli deep orange red.

Total body length .86 mm.; head length .096 mm., width .13 mm.; prothorax length .11 mm., width .14 mm.; pterothorax width .174 mm. Segments of antenna: length (width) I, 18 (24); II, 33 (21); III, 45 (18); IV, 42 (15); V, 36 (15); VI, 45 (15); VII, 9; VIII, 12; total length 234 microns. Length of spines, interocellars 45 m., postoculars 27 m., on anterior margin and angles of prothorax 48, on posterior angles, outer 60, inner 48, fourth from the outside along the posterior margin 30, on ninth abdominal segment 81, short spur-like spines 15, on tenth 81 microns.

Head wider than long, but not so conspicuously transverse as in the female; cheeks almost straight and parallel. Interocellar spines longer than postoculars. Eyes and ocelli normally developed. Antennae slender, two and one-half times as long as head, pedicel of third segment without pronounced sub-basal thickening.

Prothorax only slightly wider than head, all normal spines present, those along posterior margin uniformly small except only the fourth as in the female. Wings fully developed with spines as follows: costa 19-22, fore vein 19-20, hind vein 15-16. Abdomen slender.

Described from one ♂ and ten ♀ specimens taken at Honolulu on March 19, 1927, by Mr. O. H. Swezey on young corn plants. Holotype and allotype in author's collection, paratypes deposited in the collection of the Hawaiian Entomological Society, Honolulu. (Moulton No. 1817).

This species may be compared with *pallida* Uzel (Europe), *dampfi* Priesner (Egypt), *ameliae* Hood (Panama) and *sulphurea* Schmutz (India). *Pallida* is darker in color and stouter. Prominent spines on prothorax almost twice as long and the longest spines on the ninth abdominal segment approximately 140-150 m. in *pallida* as compared with 120 in this species, and by the lesser number of spines on the hind vein of the fore wing, 10-12 as compared with 15 in *flavens*. Third antennal segment is about 1.5-1.7 times longer than wide, while it is clearly three times as long as wide in this species. In *dampfi* the interocellar bristles are placed between the posterior ocelli while in this species they are placed in front of and in the direction of the anterior ocellus. *Ameliae* is much larger, 1.3 mm. in length, and abdominal tergites are blotched with gray in the middle, antennal segments three, four and five yellow at the base with remaining portions dark. Wings uniformly pale brown. In *flavens* segment three of antenna is yellow, four and five also yellow with only a slight indication of gray brown in the outer portions. *Flavens* can be distinguished from *sulphurea* by its clearer yellow color; *sulphurea,* as its name indicates, has a color of sulphur yellow, the body spines are dark and antennal segments four and five are darker with six entirely dark brown and the interocellar spines are placed between the posterior ocelli as in *dampfi*. *Flavens* may be distinguished from *gossypii* Morgan (North America) by the prominent orange colored crescents of ocelli and by the light yellow color of all body spines including postoculars which are brown in *gossypii*.

Taeniothrips hawaiiensis (Morgan).

Euthrips hawaiiensis Morgan, Proc. U. S. Nat. Mus., 46, p. 3, 1913.

Many recent collections forwarded to me indicate that *hawaiiensis* is the common representative of this genus especially on the Island Oahu. I am here presenting a brief description of the male which has not been described heretofore.

Color: body, legs and wings uniformly light yellow. Antennal segments one to three yellow, four and five yellow in basal half, brown in distal half, six brownish yellow in basal third, brown in distal two-thirds, seven and eight brown, crescents of ocelli deep orange red, although in one specimen there is only a slight indication of an orange shading and in a second specimen the crescents are clear yellow. Prominent body spines brown.

Total body length .93 mm.; head length .10 mm., width .12 mm.; prothorax length .10 mm., width .15 mm.; pterothorax width .20 mm. Segments of antenna: length (width) I, 15 (21); II, 33 (24); III, 45 (18); IV, 48 (18); V, 33 (15); VI, 48 (15); VII, 6; VIII, 6; total length 225 microns. Length of spines, anteocellars and postoculars 18 m., on posterior angles of prothorax, outer 42 m., inner 45 m., longest spines on ninth abdominal segment 54, on tenth 75 microns. A series of four slender yellow spines border posterior margin of ninth tergite, inner pair slightly longer than outer ones. Spines on fore wings, costa 24, fore vein 4 and 3 in basal part and 3 scattered beyond the middle, hind vein 11.

Numerous specimens of this species were taken on roses, cotton, *Ipomoea, Psidium, Hibiscus* (wild), aster, *Canna, Lantana* (blossoms) and *Ipomoea insularis* by Messrs. D. T. Fullaway, F. X. Williams and O. H. Swezey at Honolulu, Tantalus and Waipahu. Specimens deposited in the collection of the Hawaiian Entomological Society, Honolulu. (Moulton Nos. 204, 205, 206, 1437, 1439, 1442, 1821, 1824, 1825, 2538 and 2540).

The male of this species upon first view resembles very closely the male of *Frankliniella flavens* but may be quickly separated from it by the placement of the spines on the fore vein of the fore wing and by the absence of prominent spines on the anterior angles of prothorax.

Thrips (Ctenothripella Pr.) **abdominalis** Crawf. 1910

Numerous specimens of this species were collected by Mr. O. H. Swezey from the blossoms of the following flowers: asters, Honolulu, April 13, 1927; *Verbesina enceliodes,* Gilbert, Oahu, July 19, 1926; *Lantana,* Honolulu, April 18, 1927. (Moulton Nos. 1821, 1823 and 1825).

This is now recognized as a cosmopolitan species found in the

United States and Mexico and I now have specimens from India and Japan and Mr. R. S. Bagnall has recorded it from the Fiji Islands.

Thrips tabaci Lind.

Numerous specimens of this species collected by Mr. O. H. Swezey from the following flowers: aster, Honolulu, April 13, 1927; *Ipomoea insularis,* Waipahu, Oahu, May 24, 1927; roses Olinda, Maui, June 15, 1927. (Moulton Nos. 1821, 2540 and 2542.)

This is a cosmopolitan species and is now recorded from the Hawaiian Islands.

Thrips saccharoni n. sp.

Female holotype: Color uniformly dark grayish brown, thorax sometimes a little lighter. Abdominal segments three to eight with a distinctly darker line along anterior margin. All legs uniformly light brownish yellow. Antennal segments one and two grayish brown like thorax, two lighter in distal half, three, four and basal halves of five and six light grayish yellow, outer portions of five and six together with seven dark gray brown. Wings clear to smoky in basal fourth, uniformly brown in outer three-fourths with veins a little darker. Crescents of ocelli deep orange red.

Total body length 1.05 mm.; head length .12 mm., width .12 mm., prothorax length .12 mm., width .14 mm.; mesothorax width .20 mm.; greatest width of abdomen .21 mm. Segments of antenna: length (width) I, 15 (24); II, 33 (24); III, 48 (15); IV, 45 (15); V, 39 (15); VI, 51 (15); VII, 15; total length 246 microns. Spines on posterior angles of prothorax 42 m., on outer posterior angles of ninth abdominal segment 105 m., on tenth 90 microns.

Head about as long as wide, apex rounded, slightly constricted behind the eyes; cheeks arched, back of head with transverse wrinkles. A pair of rather prominent spines (30 m.) near anterior inner margin of eyes; interocellar spines small and placed in front of posterior ocelli and between them and the anterior ocellus. An irregular crescent-shaped row of six or seven spines bordering posterior margin of eyes, the first or inner pair 21 m., the third from the inside 30m., the fifth pair about as long as the inner ones, others shorter. Eyes prominent, slightly protruding, strongly pilose and occupying about one-half the length of the head. Ocelli rather small, though well developed, sub-approximate, placed opposite posterior half of eyes, posterior ocelli separated from inner margins of eyes. Mouth cone reaches three-fourths over prosternum. Antennae two and one-third times as long as head, with segments three to six long and slender, pedicel of segment three with a distinct smoothly rounded sub-basal thickening; forked sense cones on segments three and four slender.

Prothorax as long or slightly longer than head and only a little wider; two prominent spines on each posterior angle and a row of three on each side along posterior margin, inner pair strongest, numerous other smaller spines scattered over dorsum. Legs normal. Wings fully developed, of nor-

mal shape, reaching tip of abdomen; fore vein with seven (4-3) basal bristles and three scattered in distal half, posterior vein with thirteen.

Abdomen long and slender, comb on posterior margin of segment eight well-developed, tenth segment with dorsal suture.

This species is comparatively slender and is especially characterized by the long spines bordering the anterior inner margin of eyes.

Described from twenty-nine ♀ specimens taken from sugar cane by Mr. O. H. Swezey at Honolulu. Holotype in author's collection, paratype deposited in the collection of the Hawaiian Entomological Society, Honolulu. (Moulton No. 1449.)

Thrips sacchari Kobus has already been described from the same host plant but I do not know this species and cannot make a comparison.

Isoneurothrips antennatus n. sp.

Male holotype: Color uniformly dark brown, including antennae, legs and wings, except fore legs and basal portion of wings which are a little lighter. All spines dark brown; crescents of ocelli orange red.

Total body length 1. mm.; head length .11 mm., width .16 mm.; prothorax length .12 mm., width .19 mm.; mesothorax width .25 mm.; greatest width of abdomen .22 mm. Antenna: length (width) I, 21 (30); II, 39 (27); III, 60 (18); IV, 54 (20); V, 42 (18); VI, 48 (15); VII, 24; total 300 microns. Spines, interocellars 48 m., postoculars 39 m., on posterior angles of prothorax 60 m., median dorsal spines on ninth abdominal segment 43 m. and on posterior angles 84 m., curved spines on tenth 90 microns.

Head about one-third wider than long, relatively large, apex broad and almost flat; cheeks rather abruptly arched in middle where the cheek spines are placed. Interocellar bristles strong, placed between posterior ocelli on a line connecting their anterior margins; a crescent-shaped row of spines bordering posterior margin of eyes, outer two about one-half as long as third, which is the prominent postocular, inner three spines small. Eye large, prominent, but not protruding, occupying half the length of the head, spinose, facets coarse. Ocelli large, twice as large as facets of eyes, widely separated, posterior pair almost contiguous with inner margins of eyes. Mouth cone reaching almost across prosternum, broad at base, abruptly constricted in the middle, and narrowed toward the tip. Antennae long and slender, about three times as long as head, segment seven half as long as six; forked sense cones on segments three and four.

Prothorax only a little wider than head, sides arched, angles rounded; two prominent spines on each posterior angle. subequal, other spines scattered on sides and dorsal surface. Mesothorax widest, sides rounded, metathorax smaller, sides almost parallel. Legs moderately stout with numerous spines. Wings reaching beyond tip of abdomen, veins regularly set with spines, costa 25-30, fore vein 21, hind vein 15-16.

Abdominal sternites three to seven inclusive with elongate reniform depressions, 83 x 15 microns, comb along posterior margin of segment eight fully developed but weak; median dorsal spines on segment nine rather small, a strong slightly curved spine on each posterior angle, and a similar

strong but straight shorter spine (66 m.) projecting outwards from the middle of each side, a strong and distinctly curved spine on each posterior angle of tenth segment.

Described from one ♂ specimen taken on *Metrosideros polymorpha* by Mr. F. X. Williams, Mt. Tantalus, Oahu, in April, 1926. Male holotype in author's collection. (Moulton No. 1438.)

This species may be separated from *I. multispinus* Bagn. by its larger size and uniformly dark color. *Multispinus* has a totally yellow head and thorax with a reddish brown tinge and legs yellowish white.

Isoneurothrips dubautiae n. sp.

Female holotype: Color: body, legs, wings and segments one to four of antennae whitish with only a faint shading of light yellow in the more heavily chitinized parts, segment five shading to brown in outer half, six and seven dark brown, with six lighter at base. All body and wing spines transparent except prominent ones on posterior angles of prothorax and tip of abdomen which are shaded brown to dark brown. Crescents of ocelli light brownish or colorless; pigment of compound eyes deep red. Tip of mouth cone dark.

Total body length 1.26 mm.; head length .133 mm., width .15 mm.; prothorax length .15 mm., width .18 mm.; mesothorax width .25 mm. Antenna: length (width) I, 24 (30); II, 33 (27); III, 48 (20); IV, 45 (20); V, 36 (21); VI, 45 (20); VII, 18; total length 255 microns. Spines, interocellar 24 m., postoculars 27 m., pair on posterior angles of prothorax subequal 45, on posterior angles of ninth abdominal segment 96, on posterior angles of tenth abdominal segment 87 microns.

Head a little wider than long, slightly and bluntly produced in front; cheeks almost straight; all spines small, transparent and inconspicuous, only the postoculars and interocellars prominent. Eyes slightly protruding, faintly pilose, facets comparatively large. Ocelli only a little larger than facets of eyes, placed well back on head, posterior pair almost touching posterior inner margins of eyes. Mouth cone short and reaching about two-thirds across prosternum. Antennae rather compact and less than twice as long as head with normal spines and sense cones.

Prothorax with all sides and angles rounded; two prominent spines on each posterior angle, posterior marginal spines weak. Pterothorax normal. Wings reaching ninth abdominal segment, with regularly placed spines as follows: costa 25, fore vein 18-20, hind vein 14. Abdomen elongate ovate, fully developed comb along posterior margin of eighth segment; an arrangement of spines on segment nine as in *I. williamsi.*

Male allotype: Color same as in the female.

Total body length .93 mm. Abdomen: Comb along posterior margin of segment eight fully developed. Spines on wings as follows: costa 24-25, fore vein 18-19, hind vein 12.

Described from seven ♀ and ten ♂ specimens collected on *Dubautia* sp. by Mr. F. X. Williams, Mt. Tantalus, Oahu, in April,

1926. Holotype and allotype in author's collection; paratype deposited in the collection of the Hawaiian Entomological Society, Honolulu. (Moulton No. 1441.)

Isoneurothrips fullawayi n. sp.

Female holotype: Color uniformly dark brown including antennae and legs, except median part of outer half of fore tibiae and all tarsi, which are light yellowish brown, and fore wings except an irregular lighter area near base. Crescents of ocelli orange-brown. All body and wing spines dark brown.

Total body length 1.16 mm.; head length .114 mm., width .144 mm.; prothorax length .12 mm., width .194 mm.; mesothorax width .255 mm. Antenna: length (width) III, 45 (21); IV, 39 (21); V, 33 (18); VI, 36 (18); VII, 18; total 225 microns. Spines, interocellar 66 m., postoculars 66 m., pair on posterior angles of prothorax sub-equal 75 m., innermost spines on posterior margin 45 m., on posterior angles of ninth abdominal segment 96 m., on tenth 81 microns.

Head about one-fourth wider than long, angular in front; cheeks roughened, slightly arched; vertex with transverse wrinkles near posterior margin. Interocellar bristles long and strong, placed between posterior ocelli and in a line connecting their anterior margins. A crescent-shaped row of six spines bordering posterior margin of each eye, the two outer ones are short and stout, the third bristle, the postocular prominent, the three inner spines are small and inconspicuous; a pair of spines on either side of anterior ocellus. Eyes large occupying one-half the length of the head, facets large, sparsely but coarsely spinose. Ocelli well developed, widely separated, posterior pair approximate, but not contiguous with inner posterior margins of eyes, crescents narrow. Mouth cone elongate, triangular and reaching to posterior margin of prosternum. Antennae moderately stout, almost twice as long as head, segment three longest, style stout and about one-half as long as six.

Prothorax one-third wider than long, all angles rounded; two long, stout spines on each posterior angle; two or three spines on each side along anterior margin, inner pair largest, outer ones smaller, four spines on either side along posterior margin, the innermost are longest; many other dark conspicuous spines averaging about 24 m. in length, scattered over dorsum. Legs moderately stout, spinose. Wings strong, reaching to tip of abdomen, 24-26 spines on costa, 18-21 on fore vein, 13-15 on hind vein, all spines evenly placed.

Abdomen elongate ovate, segment eight with fully developed comb along posterior margin, spines on segments nine and ten stout, complete dorsal suture on segment ten.

Male allotype: Color as in female, uniformly deep brown, including fore wings and legs, except tips of fore tibiae and all tarsi.

Total body length .92 mm. Conspicuously spinose like the female. Wings with spines as follows: costa 23-24, fore vein 18-19, hind vein 12-13. Oval depressions on ventral sides of abdominal segments three to seven, small, averaging about 24 m. long; fully developed comb along posterior margin of segment eight, segment nine with a pair of moderately long, stout spines (36 m.) near center along posterior margin, another smaller pair anterior to

these and more widely separated, and a single long, slightly curved spine on each posterior angle (75 m.).

Described from one ♂ and four ♀ specimens taken on *Broussonetia papyrifera* by Mr. D. T. Fullaway in Pauoa Valley, Oahu, T. H., in May, 1909. Holotype and allotype in author's collection; paratype deposited in the collection of the Hawaiian Entomological Society, Honolulu. (Moulton No. 210.)

I take pleasure in naming this species after the collector, Mr. Fullaway.

Isoneurothrips williamsi n. sp.

Female holotype: Color: body, legs and wings light brownish yellow with thorax shaded a little darker, with a brown line along anterior margins of tergites three to seven. Antennal segment one whitish, two and basal third of three brownish yellow, concolorous with head, distal half of three dark grayish brown except at extreme tip where it is translucent whitish, four to seven uniformly dark gray brown except extreme base of four which is lighter. All prominent spines dark brown with a group of eight to ten on each side of abdominal segments two to seven rather conspicuous against the light color of the abdomen. Crescents of ocelli yellowish brown.

Total body length 1.5 mm. (Abdomen normal); head length .12 mm., width .15 mm.; prothorax length .16 mm., width .18 mm.; mesothorax width .26 mm. Antennae: length (width) I, 27 (30); II, 39 (27); III, 51 (24); IV, 48 (21); V, 39 (18); VI, 45 (18); VII, 21; total length 270 microns. Spines, interocellar 45 m., postoculars 39 m., on posterior angles of prothorax outer 75, inner 66, innermost in the series along posterior margin 39, on posterior angles of ninth abdominal segment 114, along posterior margin 90, on tenth segment 96 microns.

Head only slightly wider than long, rounded in front. Eyes slightly protruding, occupying less than half the length of the head, pilose, facets coarse. Ocelli a little larger than facets of eyes, widely separated, posterior pair contiguous with inner margins of eyes. Mouth cone elongate, reaching almost to posterior margin of prosternum, constricted at one-third its length from base and then gradually reduced to a narrow, almost pointed tip. Antennae only slightly more than twice as long as head, spines and sense cones normal as in other species of the genus.

Prothorax with sides arched and all angles broadly rounded, two prominent spines on each posterior angle, the outer pair somewhat longer than inner pair; inward from these is a row of three spines on either side along posterior margin, the inner pair longest. Legs slender. Wings fully developed. Spines on veins of fore wings evenly placed as follows: costa 27-28, fore longitudinal vein 25, hind vein 20.

Abdomen long and slender with a group of eight to ten dark spines on each side of segments two to seven; comb on posterior margin of segment eight well-developed with long closely placed hairs; a whorl of six strong spines along posterior margin of segment nine; a strong though shorter pair near the middle of the segment and about one-fourth the segment's width inward from either side; segment ten with four strong dorsal spines

near the middle. Dorsal suture present but difficult to observe because of the light body color.

Described from three ♀ specimens taken by Mr. F. X. Williams, Mt. Tantalus, Oahu, in April, 1926. Host plant unknown. Holotype in author's collection; paratype deposited in the collection of the Hawaiian Entomological Society, Honolulu. (Moulton No. 1440.)

I take pleasure in naming this species after the collector, Mr. Williams.

All of these new species of *Isoneurothrips* have certain characters in common which are worthy of mention. The third from the outside in the series of six spines behind each eye is long and strong and recognized as the prominent postocular, while the two outer ones are intermediate in size between the third and the three smaller inner ones. The interocellar spines are constantly placed between the posterior ocelli but near a line drawn across their upper borders. Also there are constantly two small spines on either side of the anterior ocellus. The comb on the posterior margin of abdominal segment eight is developed in the males of three of these species. The male of the fourth *I. williamsi*, is unknown.

Isoneurothrips fullawayi, would seem to most nearly approach *I. multispinus* Bagn., but differs from his description as follows:

I. fullawayi Moulton	*I. multispinus* Bagn.
♀ : Head and prothorax almost equal in length.	♀ : Prothorax distinctly longer than head.
Spines on fore wing, fore vein 18-21, hind vein 12-14. Style long, one-half the length of segment six.	Spines on fore wings, fore vein and hind vein 17 each. Style one-fourth the length of segment six.
♂ : Length .92 mm.	♂ : Length .65 mm.
Color: Uniformly deep brown except tips of fore tibiae and all tarsi which are light yellowish brown and an indistinct lighter area near base of fore wings.	Color: Head and prothorax totally yellow with a reddish brown tinge, antennae with a grayish brown tinge, legs yellowish white.

Selenothrips rubrocinctus (Giard), 1913

Numerous ♀ and ♂ specimens collected in Honolulu from mango leaves in November, 1909 and November, 1926 by Messrs.

D. T. Fullaway and O. H. Swezey, and from *Croton* leaves in March, 1927 by Mr. O. H. Swezey. (Moulton Nos. 226, 1146 and 1819).

TUBULIFERA

Family PHLOEOTHRIPIDAE Uzel, 1895

Subfamily PHLOEOTHRIPINAE Priesner

Tribe HOPLOTHRIPINI Priesner

Dermothrips hawaiiensis Bagn. 1910.

Two apterous specimens one ♂ and one ♀ which I am identifying as belonging to this species were collected as follows: one ♂ specimen taken from under the bark of a dead tree on February 6, 1927, in the Waianae Mts., Oahu at an elevation of 2000 feet and one ♀ specimen taken on *Suttonia* at Olinda, Maui, June 14, 1927 by O. H. Swezey (Moulton Nos. 1815 and 2545).

Hoplothrips flavitibia n. sp.

Female holotype: (Macropterous) Color chestnut brown with apex, and sides of head, sides of thorax and antennal segments one, two, six and eight darker, three yellowish shading light brown at tip, four and five yellowish in basal half and six yellowish in basal third with the distal portions brown, all femora brown, all tibiae and tarsi yellow, wings uniformly light grayish brown, prominent body spines yellowish.

Total body length 2.4 mm.; head length .26 mm., width behind eyes .25 mm., width at posterior margin .22 mm.; prothorax length .22 mm., width .43 mm.; pterothorax width .43 mm.; tube length .20 mm., width at base .10 mm., at tip .04 mm. Antennae: Length (width); I, 39 (48); II, 66 (36); III, 84 (45); IV, 78 (45); V, 72 (39); VI, 72 (36); VII, 60 (30); VIII, 51; total length 540 m. Length of eye 74 m., distance between posterior margin of eye and postocular pits 24 m. Spines, postoculars 114, on anterior margin of prothorax vestigial, on anterior angles 75, mid-laterals 165, on fore coxae 90, on posterior angles outer 120, inner 150. Prominent basal wing spines, first 66, second 120, on posterior angles of ninth abdominal segment 195, at end of tube 150 microns.

Head slightly longer than wide, broadest just behind the eyes. Antennal pits concave, their depressions causing the eyes to appear slightly projecting in front; cheeks swollen behind eyes and converging evenly and gradually to the weakly neck-like constriction at posterior margin. Few cheek spines present, yellowish in color and inconspicuous. Postoculars long and pointed, placed one-third the length of the eyes from their posterior margins. Eyes relatively large. Ocelli large, placed well forward and clearly separated from the inner margin of eyes. Mouth cone reaching to near posterior margin of prosternum, broadly rounded, tip of labrum pointed. Antennae somewhat more than twice as long as head with segment eight spindle shaped and clearly separated from segment seven;

sense cones relatively long and narrowed toward the tip but not sharply pointed, segment III with three, segment IV with four, segment V with three, segment VI with two.

Prothorax twice as wide as long. Spines along anterior margin vestigial, those on anterior angles, mid laterals, fore coxae and posterior angles long and pointed. Mid laterals placed far forward and distant only 45 m. from those on anterior angles. Pterothorax slightly wider than prothorax including prominent fore coxae. Sides rather evenly but distinctly narrowed toward the posterior. Fore legs enlarged, each fore tarsus with a strong, sharp tooth. Wings fully developed with eight to ten double fringe hairs. Abdomen elongate with long spines on all segments, those on segment nine almost as long as tube.

Male allotype: (Brachypterous) Color quite uniformly yellowish brown with apex and sides of head darker, antennal segments one, six to eight, ninth abdominal segment and tube distinctly darker brown. Antennal segment two brown only at the base yellowish in outer portion, three to six yellowish with extreme base of seven yellowish, three shading gradually to brown and four and five a little deeper brown. Legs yellowish with all femora grayish brown.

Total body length 2.66 mm.; head length .25 mm., width .23 mm.; prothorax length .32 mm., width, including coxae, .55 mm.; pterothorax width .46 mm.; tube length .18 mm., width at base .1 mm. Fore femora length .40, width .166 mm. Antennae: Length (width) I, 45, (48); II, 60 (36); III, 78 (39); IV, 72 (39); V, 69 (36); VI, 63 (33); VII, 54 (27); VIII, 51; total length 495 microns. Length of eye 45 m., distance between posterior margin of eye and postocular pit 30 m. Spines, postoculars 135, on anterior margin of prothorax vestigial, on anterior angle 120, mid laterals 180, on posterior angles outer 120, inner 150, on posterior angles of ninth abdominal segment inner 180, spurs 60, at end of tube 150.

Head shaped as in female. Eyes smaller, ocelli present but very small and widely separated from eyes. Mouth cone shorter and reaching approximately to middle of prosternum. Antennae as in female.

Prothorax greatly enlarged with all spines long and pointed as in female. Pterothorax clearly smaller than prothorax and smaller than abdomen. Fore femora greatly enlarged and each fore tarsus armed with a strong tooth. Wings rudimentary. Abdomen large with segments two to four clearly broadest and gradually reduced toward the tube. Tube only slightly shorter than head with sides narrowed evenly toward the tip.

Female paratype: (Brachypterous) General color and shape like the macropterous female. Eyes smaller and shaped as in the male. Ocelli extremely small and widely separated from the eyes as in the male. Wings represented only by two small pads, each with two spines, the outer about twice as long as the inner one.

Total body length (body distended) 2.83 mm.; head length .25 mm., width behind eyes .25 mm., width at posterior margin .22 mm.; prothorax length .25 mm., width, including coxae, .46 mm.; pterothorax width .42 mm.; tube length .23 mm., width at base .10 mm. Antennae: Length (width) I, 45 (48); II, 63 (36); III, 78 (45); IV, 74 (45); V, 72 (39); VI, 66 (36); VII, 57 (33); VIII, 48; total length 510 microns. Length of eye 51 m., distance between posterior margin of eye and postocular pit 30 m.

Spines postoculars 135, on anterior margin of prothorax vestigial, on anterior angles 81-90, mid laterals 165, on prominent coxae 90, on posterior angles outer 126, inner 150, on posterior angles of ninth abdominal segment 180, at end of tube 150.

Larva uniformly yellowish gray with antennal segment one white, two light brown and three to seven dark brown and abdominal segment nine and ten brown.

Described from 12 macropterous ♀, 28 brachypterous ♀, 5 brachypterous ♂ specimens, six larvae and four pupae taken in the Waianae Mts., Oahu, under the bark of dead trees; and from old borer tunnel in dead *Suttonia* trees on Waipio Ridge, Oahu, by Mr. O. H. Swezey. Holotype in author's collection, paratypes deposited in collection of the Hawaiian Entomological Society, Honolulu. (Moulton Nos. 1815, 2549 and 2552).

This species may be compared with *laticornis* Bagnall, (*Dolerothrips*) *japonicus* Karny, (*Dolerothrips*) *lanaiensis* Bagnall and (*Dolerothrips*) *ovatus* Bagnall but separated from them as follows: *japonicus* is larger, 2.9-3.7 mm., darker in color and head is broader in the middle; *laticornis* is smaller, 2.0 mm., has short rudimentary spines on fore angles of prothorax and sixth antennal segment is not abruptly yellowish at the base; *lanaiensis* has very short bristles on posterior angles and margin of prothorax; *ovatus* is smaller, 1.9-2.8 mm., and fore coxae have only short spines on prominent angles.

Hoplothrips mauiensis n. sp.

Female holotype: (Macropterous) Color chestnut brown, with apex and sides of head and sides of thorax darker; antennae dark brown, with segments three, four and five somewhat lighter in basal portions; all femora dark brown, tibiae yellowish brown, shaded a little darker in the middle, all tarsi yellow. Wings brownish gray.

Total body length 2.15 mm.; head length .25 mm., width .25 mm.; prothorax length .22 mm., width (including prominent coxae) .43 mm.; mesothorax width .45 mm.; greatest width of abdomen .46 mm.; tube length .25 mm., width at base .10 mm., at tip .05 mm. Antennae: Length (width) I, 24 (51); II, 60 (39); III, 81 (45); IV, 78 (45); V, 66 (42); VI 57 (36); VII, 54 (33); VIII, 54 (21); total length 480 microns. Spines, postoculars 105 m., on anterior margin and angles of prothorax vestigial, mid laterals 105, on fore coxae 81, on posterior angles and posterior margin 140, on posterior angles of ninth abdominal segment 150 on posterior margin 180, at end of tube 180. Only two prominent basal wing spines 105 and 150 m. respectively, basal wing spines on second paratype 60 and 150 microns. Length of eye 78 m., distance between postocular margin of eye and postocular pits 27 microns.

Head as long as wide, slightly swollen behind eyes; cheeks evenly rounded and reduced gradually toward posterior margin. Postocular spines long and pointed, a small spine immediately behind each posterior ocellus. Eyes small, semi-oval in outline. Ocelli large, widely separated, posterior pair separated from inner margins of eyes. Mouth cone large, triangular, reaching to near posterior margin of the prosternum. Maxillary and labial palpi unusually small almost vestigial. Antennae twice as long as head; segment one broadest, three sub-conical, four and five roundly clavate, four widest of intermediate segments, other distal segments gradually becoming narrower toward tip; sense cones comparatively small, 2 on segment three, 4 on segment four, 2 on segment five, 1+1 on segment six, 1 on segment seven, 1 on segment eight.

Prothorax almost twice as wide as long; spines, mid laterals, one on each prominent fore coxae and two on each posterior angle long and pointed. Fore femora enlarged, fore tarsi armed with a strong tooth. Wings fully developed with nine to ten double fringe hairs on posterior margin.

Abdominal segments two to seven of about uniform width, eight and nine abruptly smaller. Bristles on angles of abdominal segments long and pointed. Tube almost as long as head.

Female paratype: (Brachypterous) Similar in color and size to the macropterous female except that the prothorax is much larger, length .30 mm. as compared with .22 mm. and width .51 mm. as compared with .43 mm. The fore femora are larger. Eyes and ocelli are smaller as in the male and the abdomen is broadly ovate, .60 mm. in width as compared with .46 mm. in the macropterous female. Wings rudimentary.

Male allotype: (Brachypterous) Similar to the brachypterous female in color and general appearance.

Total body length 1.66 mm. (body not distended); head length .25 mm., width .23 mm.; prothorax length .30 mm., width .46 mm.; pterothorax width .46 mm; abdomen width .55 mm.; tube length .20 mm.; width at base, .10 mm. Antennae: Length (width) I, 45 (54); II, 54 (36); III, 75 (42); IV, 66 (42); V, 63, (39); VI, 57 (33); VII, 48 (30); VIII, 45; total length 465 microns. Length of spines, postoculars 105, on anterior margin and angles of prothorax vestigial, mid-laterals 105, on fore coxae 105, on posterior angles and posterior margin 120, on posterior angles of ninth abdominal segment, inner 180, spurs 60. Length of eye 51 m., distance between posterior margin of eye and postocular pits 24 microns.

Described from seven macropterous, eleven brachypterous ♀ and three ♂ specimens collected under bark of dead *Acacia koa* tree at Olinda, Maui, October 10, 1926 and September 10, 1927 by Mr. O. H. Swezey. (Moulton Nos. 1445, 1814).

Allotype and holotype in author's collection, paratypes deposited in the collection of the Hawaiian Entomological Society, Honolulu.

Hoplothrips swezeyi n. sp.

Female holotype: (Macropterous) Color deep chestnut brown with first and second abdominal segments lighter. Antennal segments one, two, six

and eight blackish brown, three yellowish in basal two-thirds, shading to dark brown in distal third, four and five yellowish in basal third and six at extreme base with distal portions abruptly blackish brown. Legs with all femora concolorous with body, fore tibiae somewhat lighter, middle and hind tibiae lighter only at extreme ends, all tarsi brown. Wings uniformly grayish brown. Postoculars and other prominent body spines clear yellow.

Total body length (abdomen drawn in) 2.66 mm.; head length .32 mm., width .26 mm.; prothorax length .20 mm., width (including coxae) .43 mm.; pterothorax width .52 mm.; tube length .22 mm., width at base .10 mm. Antennae: Length (width) I, 45 (48); II, 75 (39); III, 105 (42); IV, 105 (42); V, 90 (39); VI, 78 (33); VII, 60 (30); VIII, 48; total length 615 microns. Length of spines, postoculars 105, on anterior margin and angles of prothorax vestigial, mid-laterals 165, longest spurs on fore coxae 27, on posterior angles outer 120, inner 90. Basal wing spines 60 and 135, on posterior angles of ninth abdominal segment inner 180, outer 120, at end of tube 195 microns. Length of eye 90 m., distance between posterior margin of eye and postocular pit 30 microns.

Head about .2 longer than wide, broadest back of eyes; cheeks converging gradually to the slight neck-like constriction at base and with a few short sharp brown spines. Postocular spines long and pointed and placed closely behind eyes. Eyes rather large with small facets. Posterior ocelli large and placed in front of a line drawn through center of eyes, approximate to but separated from their inner margins. Mouth cone triangular in shape, rounded at tip and reaching almost to posterior margin of prosternum. Labrum pointed. Antennae twice as long as head; sense cones narrow and pointed, segment III with three, IV with four, V with two, VI with two, segment eight rather broadly joined to segment seven but clearly separated.

Prothorax trapezoidal in shape and sides evenly formed, mid-laterals and a pair of spines on each posterior angle long and pointed. Pterothorax clearly wider than prothorax. Fore femora enlarged, each fore tarsus armed with a sharp tooth. Wings fully developed, broadest at base, gradually narrowing to a broadly rounded tip. Each fore wing with twelve double fringe hairs and two prominent basal spines, distal one being about three times as long as the proximal one.

Abdomen long and broad with second segment largest. Tube about .3 shorter than head.

Female paratype: (Brachypterous) Colored and shaped as in macropterous form but with eyes and ocelli smaller, pterothorax smaller and abdomen more broadly ovate, also the outer spines on the posterior angles of each abdominal segment are much shorter than the inner pair, being approximately one-half as long and intermediate in size between these same spines of the macropterous female and the brachypterous male. Wings represented only by small pads.

Male allotype: (Brachypterous) Similar to the brachypterous female except that the fore femora are more greatly enlarged and the abdomen is reduced gradually from second segment on instead of being broadly ovate, and one pair of spines on the posterior angles of ninth abdominal segment is reduced to spurs.

Total body length (abdomen drawn in) 1.6 mm.; head length .25 mm., width .22 mm.; prothorax length .20 mm., width .38 mm.; pterothorax width .42 mm.; abdomen width .50 mm.; tube length .20 mm., width at base .08 mm. Antennae: Length (width) I, 30 (42); II, 52 (33); III, 87 (36); IV, 75 (36); V, 75 (36); VI, 60 (33); VII, 51 (30); VIII, 45; total length 495 microns. Length of eyes 60 m., distance between posterior margin of eye and postocular pit 30 m. Length of spines, postoculars 90 m., on anterior margin and anterior angles of prothorax vestigial, mid-laterals 120, on posterior angles, outer 90, inner 60, on posterior margin of ninth abdominal segment inner 150, outer, spurs 30, at end of tube 150 microns.

Larva light brownish yellow with antenna, legs and last two abdominal segments brown, bright red pigment uniformly distributed throughout head, thorax and abdomen except for a series of white spots, one on either side of each abdominal segment.

Described from 4 macropterous and 8 brachypterous ♀ and 4 brachypterous ♂ specimens taken at Olinda, Maui, on dead wood of *Pipturus, Suttonia* and dead stems of *Rubus hawaiiensis* on June 14, 1927 by Mr. O. H. Swezey. Holotype and allotype in author's collection, paratypes deposited in the collection of the Hawaiian Entomological Society, Honolulu. (Moulton Nos. 2544, 2545, 2546).

This species appears to stand nearest to *H. ovatus* Bagnall (*Dolerothrips ovatus* Bagn.) but may be separated by its shorter head, long mouth cone which reaches almost to posterior margin of prosternum and by the distinctly brownish colored wings; also it may be separated from *H. (Dolerothrips) intermedius* Bagnall by its differently colored antennae and darker fore femora.

Macrophthalmothrips hawaiiensis n. sp.

Female holotype: Color: head and thorax deep brown, blotched sparsely with red pigmentation, abdomen lighter, gradually shading to the dark tube which is concolorous with head. Legs with all femora dark brown, fore tibiae yellowish, shaded brown on upper and lower margins of basal two-thirds, middle and hind tibiae dark brown, yellow at extreme base and in distal third, all tarsi yellow. Antennal segments one and two dark brown, two shading lighter in outer half, three light brownish yellow shading brownish gray in outer third, four to eight dark gray brown. Wings grayish brown, lighter at base, each with a dark median line which fades before the end.

Total body length 2.22 mm.; head length .30 mm., width .18 mm.; prothorax length .18 mm., width .28 mm.; pterothorax width .33 mm.; greatest width of abdomen .33 mm.; tube length .13 mm.; fore femora length .20 mm., width .10 mm. Segments of antennae: length (width) II, 60 (30); III, 99 (27); IV, 78 (30); V, 63 (25); VI, 60 (25); VII, 45 (21); VIII, 30; total length 465 microns. Length of spines, on anterior angles of

prothorax 30 m., mid-laterals 30 m., on posterior angles, outer 60 m., inner 42 m., on posterior angles of ninth abdominal segment 105, on posterior margin 90, at tip of tube 120 microns. Basal wing spines 36, 42 and 45 m. respectively.

Head one and two-thirds times as long as greatest width, eyes large occupying the entire anterior end of the head and in outline forming a half circle, broken in the center only by the projecting lobe bearing the ocelli; cheeks abruptly widened behind the eyes, almost parallel for a short distance, then smoothly and evenly constricted into a long broad neck with almost parallel sides. Eyes with small facets, not pilose, coming together on the dorsal side and completely surrounding the ocelli. Postocular spines apparently wanting. Mouth cone long and pointed, almost needle-like, reaching to the middle of metasternum. Maxillary and labial palpi very long. Antennae attached to anterior ventral side of head so that the basal segments cannot be seen in dorsal view, exposed portion about one and one-half times as long as head, segment three elongate cone-shaped, but constricted at the extreme tip, four and five vase-shaped, with ends constricted, six and seven elongate ovate, but constricted at the base, eight broadly and closely joined to seven; sense cones moderately long and stout, 2 near tip of segment three, 4 on four, and 2+1 on five, 1+2 on six, and 1 on seven.

Prothorax about equal in length to width of head, sides gradually diverging to posterior margin, dorsal surface marked with numerous transverse confluent striations, all prominent spines with dilated tips. Anterior half of mesanotal plate with striations similar to those on head and metanotal plate with longitudinal confluent striations. Femora of fore legs enlarged but unarmed, fore tibiae and tarsi also unarmed. Wings reaching to sixth abdominal segment, rather narrow but not constricted in the middle. Fore pair indistinctly and irregularly reticulate especially along dark median line. Three spines with dilated tips on fore margin at base of wing, the first two closely placed 15 m. apart, the third 60 m. from the second; with nine to ten double fringe hairs along posterior margin near tips.

Abdomen elongate with long spines on posterior angles especially on segments five to nine. Tube slender, less than half as long as head. Terminal spines as long as tube.

Male allotype: Color similar to female.

Total body length 1.75 mm.; head length .28 mm., width .166 mm.; prothorax length .18 mm., width .30 mm.; pterothorax width .26 mm.; tube length .13 mm. Antennae: length (width) II, 45 (30); III, 99 (24); IV, 84 (27); V, 72 (24); VI, 66 (21); VII, 45 (21); VIII, 33; total length of segments II-VIII 450 microns. Length of fore femora .28 mm., width through center .133 mm. Length of spines on anterior angles of prothorax 30 m., on posterior angles, outer 45 m., those on prominent fore coxae 45 m.; those at base of fore wings along anterior margin, first 30 m., second 36 m., third 45 microns.

Smaller than female but strikingly different in the enlarged prothorax and the greatly enlarged and armed fore legs. Sides of prothorax expanding so that the posterior margin is almost twice as wide as the anterior margin; spines with dilated tips. Fore femora are about as wide in the middle as basal portion of head, with a large conspicuous swelling

at the extreme base on the inner margin and a long prominent spur (15 m.) on the inner margin at about two-thirds the femora's length. Fore tibia with a low but distinct swelling on the inner margin at about three-fifths its length. Fore tarsus armed with a curved tooth arising at extreme end of first segment.

Described from one ♀ and two ♂ specimens taken from under the bark of a dead *Acacia koa* tree by Mr. O. H. Swezey at Olinda, Maui, T. H., in October, 1926. These specimens were collected along with *Phloeothrips mauiensis* and *Hoplothrips mauiensis*. Holotype and allotype in author's collection, paratype deposited in collection of Hawaiian Entomological Society, Honolulu. (Moulton No. 1445).

This species is closely related to *Macrophthalmothrips argus* Karny but may be separated by its shorter head, .30 mm., as compared to .40 mm. in *argus*, and the narrower prothorax, .28 mm., as compared with .37 mm. in *argus*.

Tribe Haplothripini Priesner

Haplothrips fusca n. sp.

Female holotype: Color uniformly brown including all segments of antennae and legs except only third and extreme tips of fore tibiae and fore tarsi which are a shade lighter. Wings transparent.

Total body length 1.83 mm.; head length .18 mm., width .166 mm.; prothorax length .15 mm., width .26 mm.; pterothorax width .30 mm.; abdomen width .32 mm.; tube length .11 mm., width at base .06 mm. Left antennae: Length (width) Right antennae: Length (width):

L. I, 24;	II, 36;	III, 39;	IV, 39;	V, 39;	VI, 36;	VII, 33;	VIII, 27;	
(27)	(30)	(27)	(30)	(27)	(27)	(24)		
R. I, 24;	II, 36;	III, 39;	IV, 42;		V, 33;	VI, 39;	VII, 18;	
(27)	(30)	(27)	(30)		(27)	(24)		

Total length of left antenna 285 m., total length of right 240 microns. Length of spines, postoculars 42 m., on anterior margin of prothorax, vestigial, not over 12-15 m., on anterior angles 30, mid laterals 18, outer spines on posterior angles 48, inner 45, on ninth abdomial segment 72-75, on tip of tube 105-120. Basal wing spines 30, 30 and 45 respectively.

Head about .1 longer than wide; cheeks evenly and slightly arched, apex rounded. Postocular spines distinct, though rather small and pointed, about .6 as long as eye. Eyes slightly protruding in front. Ocelli large, placed in front of a line drawn through center of eyes and contiguous with their inner margins. Mouth cone short and blunt, reaching about half way across prosternum. Antennae one and one-half times as long as head, all segments rather short and broad, with segment three 1.4 times as long as wide and without a sense cone on inner side. Right antenna in this holotypic specimen is abnormal with only seven segments.

Prothorax clearly transverse and shorter than head, prominent spines with blunt tips. Pterothorax with sides slightly and evenly arched. Legs normal, each fore tarsus armed with a minute tooth. Wings narrowed in the middle, fore wings with six to seven double fringe hairs, first two basal wing spines with blunt tips and third pointed. Abdomen elongate. Tube .66 as long as head and only twice as long as width at base. Spines on ninth abdominal segment rather short, terminal spines as long as tube.

Two female paratypes have 7-segmented antennae like the holotype.

Male allotype: Similar in color to female except fore tibiae, fore tarsi and also third antennal segment which are lighter yellowish brown, and the body is smaller. Length 1.66 mm. Length of spines, postoculars 30 m., on anterior margin of prothorax, vestigial, on anterior angles 36, mid laterals 27, on fore coxae 24, on posterior angles, outer 45, inner 45, on ninth abdominal segment inner 90, outer (spurs) 30, on end of tube 120 m. Basal wing spines, on left wing 24, 33 and 45 and on right wing 24, 33 and 33 respectively, the first two with blunted tips on each wing, the second with pointed tips on left wing and blunted on right wing.

Shaped as in the female except that the fore femora are much larger and fore tarsal tooth clearly stronger. There is a distinct median blackish brown line on prothorax extending from near anterior margin to the posterior margin, and the outer pair of spines on the posterior angles of abdominal segment nine are reduced to spurs. Wings with five to eight double fringe hairs. Abdomen narrowed gradually and evenly from second segment toward tube. The second male paratype is like the female in that there is no median dorsal line on prothorax.

Described from 4 ♀ and 2 ♂ specimens taken at Ft. Kamehameha, Oahu on *Batis maritima* flowers on May 8, 1927 by Mr. F. X. Williams. Allotype and holotype are in author's collection, paratype deposited in the collection of the Hawaiian Entomological Society, Honolulu. (Moulton No. 2539).

This species has the general appearance of *Haplothrips gowdeyi* (Franklin) except that antennal segments three to six are almost uniformly brown with segment three only a shade lighter and without a sense cone on the inner side. It may also be separated from *H. usitatus* Bagnall by the uniformly brown tarsi except in the male where they are lighter, and the absence of a sense cone on inner side of segment three. The tarsi are yellow in *H. usitatus* and there is a sense cone on the inner side of third antennal segment.

Haplothrips gowdeyi (Franklin), 1908

Specimens taken on cotton by Mr. D. T. Fullaway at Honolulu, in 1909 and more recently collected on *Leucaena glauca, Panicum torridum, Verbesina encelioides, Canna, Lantana, Vernonia cinerea, Emilia sonchifolia* and cockscomb by Messrs. O. H. Swezey and

F. X. Williams in 1926 and 1927 at various places on the island of Oahu. (Moulton Nos. 1439, 1447, 1448, 1818, 1823, 1824, 1825, 2549, 2550, 1551).

This species has also been recorded from Southern United States, Mexico, Central America, Cuba, Porto Rico, St. Vincent, Barbados and Australia.

Kentronothrips new genus (Kentron=spur.)

Head one and one-half times as long as wide; cheeks almost straight, smooth, slightly narrowed behind. Eyes relatively small, elongate, subtriangular in shape, occupying less than one-third the side of the head; not protruding. Postocular spines long. Antennae 8-segmented. Ocelli widely separated, fore ocellus on apex. Mouth cone very short, being only about half as long as width at base, broadly rounded. Prothorax one-third shorter than long, expanding toward the posterior. Fore femora greatly enlarged in both the male and female, more so in the male than in the female, with a blunt swelling at the base on the inside, inner margin roughened; fore tibia stout with a broad rectangular tooth at the extreme tip which supports the long spur-like tarsal tooth. The tooth on the tibia in the female is smaller than in the male, triangular in shape and the tarsal spur is smaller. Wings constricted in the middle. Tube elongate but only about .6 as long as the head.

I am placing this genus in the subfamily *Phloeothripinae,* Tribe *Haplothripini* Pr. according to Dr. Priesner's latest classification (Ref.: Die Thysanopteren Europas Part III, p. 477). The genus is near *Androthrips* Karny because of the enlarged fore femora which has a blunt swelling at the base. It also has the short rounded mouth cone and wings constricted in the middle similar to the genus *Haplothrips* Serv. It might also be placed near *Podothrips* Hood, differing from it by the more elongated and differently shaped head and smaller eyes. This genus also has an armed fore tibia as in *Kladothrips* Froggatt.

Kentronothrips hawaiiensis n. sp.

Female holotype: Color uniformly dark brown, except antennal segments three to seven and all tibiae and tarsi which are yellow.

Total body length 2.66 mm. (abdomen distended); head length .26 mm., width .166 mm.; prothorax length .20 mm., width .33 mm.; greatest width of abdomen .35 mm.; tube length .166 mm., width at base .16 mm., width at tip .08 mm Antennae: Length (width) I, 33 (42); II, 45 (30); III, 57 (27); IV, 54 (30); V, 51 (27); VI, 45 (24); VII, 45 (21); VIII, 42; total length 375 microns. Spines, postoculars 60, on anterior margin of prothorax vestigial, on anterior angles 36, mid-laterals 15, on prominent coxae 45, a pair on posterior angles sub-equal, 48, on posterior angles of ninth abdominal segment 175, at tip of tube 120 microns.

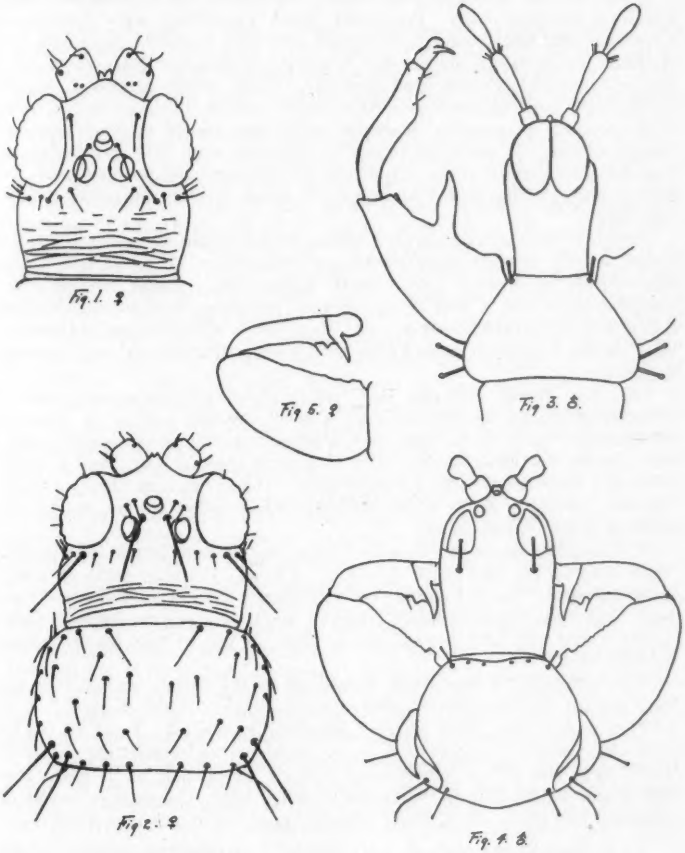


Fig. 1. *Thrips saccharoni.*
Fig. 2. *Isoneurothrips fullawayi.*
Fig. 3. *Macrothalmothrips hawaiiensis.*
Fig. 4. *Kentronothrips hawaiiensis.*
Fig. 5. *Kentronothrips hawaiiensis* foreleg of female.

Head 1.6 times as long as wide; cheeks slightly and evenly rounded to the somewhat narrower base. Postocular spines transparent with blunt tips. Eyes elongate, sub-triangular, occupying less than one-third the length of the head; facets small, not pilose. Anterior and posterior margins of eyes joining front and sides of head smoothly. Ocelli widely separated, placed far forward on head, anterior ocellus smaller, placed at tip of vertex near basal segments of antennae, posterior ocelli approximate to inner anterior margin of eye. Mouth cone unusually short, not over half its breadth at base, broadly rounded at tip. Antennae less than one and one-half times as long as head, slender, with first segment broadest, seventh and eighth clearly separated.

Prothorax with sides expanding evenly to the prominent coxae, posterior angles broadly rounded, posterior margin semicircular, all spines with blunt tips. Spines on anterior angles short, mid-laterals vestigial, two on each posterior angle and a similar one on each prominent fore coxae. Median dorsal longitudinal thickening present. Pterothorax with fore angles rounded, sides slightly and evenly arched, only a little wider than the abdomen, joining it broadly.

Fore legs greatly enlarged, fore femora almost as long as head, center about three-fourths as wide as head, a small rounded swelling at extreme base on the inside. Fore tibiae with a small triangular tooth on the inside near the tip and immediately behind it a short spine arising from a small tubercle. Fore tarsus with a distinct spur. Wings reaching about to sixth segment, narrowed in the middle and continuing rather narrow to the tip, without double fringe hairs.

Abdominal segments two to seven almost equal in both length and breadth. Tube elongate but only about .6 as long as head. Posterior pairs of wing-confining spines long and strong only on segments three, four and five. Two long blunt tipped spines on each posterior angle of segments three to eight, segment nine with long pointed spines; those at end of tube about as long as tube itself.

Male allotype: Colored and shaped as in the female except that the fore femora are somewhat larger and the abdomen is more slender.

Fore femora with inner margins noticeably roughened. Tooth at end of fore tibiae almost rectangular in shape, adjoining and supporting the large tarsal tooth and with a spine-bearing tubercle immediately at its base; fore tarsal spur longer than in the female; pointed spines on posterior angles of segment nine short, 48 m., inner posterior marginal spines long (120 m.)

Described from one ♀ and three ♂ specimens taken by the writer, October 1909 in quarantine on sugar cane arriving at San Francisco, California, from Honolulu, and 4 ♀ and 17 ♂ specimens taken at Honolulu from beneath the leaf sheaths of sugar cane on August 15, 1927, by Mr. O. H. Swezey (Moulton Nos. 225 and 2553). Holotype and allotype in author's collection, paratype deposited in the collection of the Hawaiian Entomological Society, Honolulu. I wish here to express my appreciation to Dr. H. Priesner for examining these specimens and for his suggestions in their classification.

Mesothrips setidens n. sp.

Female holotype: Color uniformly dark chestnut to blackish brown, fore tibiae lighter in the middle when viewed from the side, all tarsi brown. Antennae almost uniformly blackish brown. Wings brownish gray, darker at borders, fore pair with a median darker line extending to near middle of wings.

Total body length 4.9 mm.; head length .50 mm., width .30 mm.; prothorax length .25 mm., width (including coxae) .60 mm.; pterothorax width .75 mm.; abdomen, width of third segment .80 mm.; length of ninth segment .20 mm.; length of tube .62 mm., width at base .133 mm., at tip .066 mm. Antennae: Length (width) I, 60 (60); II, 90 (45); III, 159 (51); IV, 165 (54); V, 135 (45); VI, 105 (39); VII, 90 (33); VIII, 54; total length 900 microns. Length of spines, postoculars 210 m., anteocellar and postocellar sub-equal 60 m., spines back of postoculars and near center of head 105 m., on anterior margin of prothorax 75 m., on anterior angles 99 m., mid-laterals 108 m., on prominent coxae 63 m., the pair on posterior angles sub-equal, 180 m., on ninth abdominal segment 550 m., at end of tube 330 m. Basal wing spines 75, 120 and 240 m. respectively.

Head sub-rectangular in shape, 1.6 mm. times as long as wide, and twice as long as median dorsal line of prothorax, apex broad and flat; cheeks almost parallel. Postocular spines long and strong, extending far in front of eyes. The distance between postocular pits and the posterior margin of eyes is 45 microns which is approximately one-third the length of the eye. A single pair of spines on either side of anterior ocellus and placed approximate to inner anterior border of eye slightly less than one-third the length of postoculars, another spine of about the same length behind each posterior ocellus placed near inner margin of eyes. Vertex with another pair of spines placed behind and inward from postocular and near center of head, these are about one-half as long as postoculars. Eyes large, nearly oval in outline and occupying about one-fourth the length of the head; facets small. Ocelli large, 33 m. in diameter, placed just in front of a line drawn through center of eyes and contiguous with their inner margins. Mouth cone triangular, rounded at tip and reaching about three-fourths across prosternum. Labrum constricted near middle and drawn out to a sharp point.

Prothorax including prominent coxae two and one-half times as wide as greatest dorsal length, fore margin strongly concave with a conspicuous dark median dorsal line broadened in front and extending to the posterior margin. All normal spines present. Pterothorax with evenly rounded sides. Legs long, fore femora thickened. Each fore tarsus with a strong tooth.

This tooth is especially noticeable because it bears three distinct spines near the middle of its outer margin, these spines 45, 27 and 12 m. long respectively on the left tooth and 60, 36 and 12 microns on the right tooth.

Abdomen elongate, a little wider than pterothorax and reduced in size gradually beyond third segment, with long prominent spines especially on distal segments, those on segment nine almost as long as tube with spines at tip of tube very much smaller and less than half the length of those on segment nine. Tube long and slender, 1.2 times longer than head.

Described from one ♀ specimen taken at Manoa Valley, Oahu, on April 8, 1927, by Mr. F. X. Williams. Host plant not known. Type in the author's collection. (Moulton No. 1820.)

I am placing this species with some hesitation in the genus *Mesothrips*. The presence of a pair of spines on either side of the anterior ocellus and a second pair behind the posterior ocelli while distinct are apparently not strong enough to place this species either in the genus *Diceratothrips* Bagnall or *Dichaetothrips* Hood. The enlarged fore femora and armed fore tarsi in the female would seem to throw it out of the genus *Cryptothrips*. Long abdominal bristles would also seem to throw it out of the genus *Mesothrips* and it does not clearly belong in this genus, but I hesitate to erect a new genus without more material for study. The spines on the teeth of fore tarsi are also especially to be mentioned.

Tribe PHLOEOTHRIPINI Priesner

Phloeothrips (Phloeothrips) mauiensis n. sp.

Female holotype: Color mahogany brown, abdominal segments two to five lighter; antennal segments one and two, distal portions of three to five and six to eight, three whitish in basal half, four in basal third and five at extreme base brown, legs with all femora brown, tibiae light brown to brown, but yellowish white at either end. All tarsi yellowish. Fore wings brownish gray, lighter at base in the middle and at tip; hind wing brownish-gray with a darker median longitudinal line fading before tip. Prominent spines light brownish to transparent. Crescent of ocelli deep red.

Total body length 1.80 mm.; head length .22 mm., width .18 mm.; prothorax length .15 mm., width (including prominent coxae) .30 mm.; pterothorax width .32 mm.; tube length .133 mm. Antennae: Length (width) I, 27 (36); II, 54, (30); III, 63 (33); IV, 63 (33); V, 60 (27); VI, 48 (24); VII, 42 (21); VIII, 27; total length 390 microns. Spines, postoculars 24 m., on anterior angles of prothorax 36 m., mid-laterals 24 m., on posterior angles 45, on outer 45, inner 36, on prominent coxae 24, on posterior angles of ninth abdominal segment 66, end of tube 105 microns. Basal wing spines 30, 30 and 75 microns respectively.

Head about one-fifth longer than wide; cheeks abruptly swollen behind the eyes, then almost straight and parallel to the slightly neck-like constriction near posterior margin. A few inconspicuous spines on small tubercles along sides; postocular spines short and stout with widely dilated tips. Eyes prominent, large, occupying two-thirds the width of the head, facets small, not pilose. Ocelli well-developed, approximate, placed far forward, anterior ocellus on apex, posterior pair in front of a line drawn through center of eyes. Mouth cone very long, triangular in shape to the posterior margin of prosternum and then drawn out into a long slender point reaching to middle of mesosternum. Maxillary palpus with short first segment and very long second segment (36 m.). Labial palpi also long with segments measuring 30 m., 21 m., and the end segment 27 m., total length 72 m. Antennae about one and three-fourths times as long as head; sense cones moderately long and stout, 3 on segment three, 4 on segment four, 2+1 on segment five, 2 on segment six, and 1 on segment seven.

Prothorax including protruding coxae twice as wide as long; all prominent spines stout with widely dilated tips. Legs rather small, slender, fore femora thickened only a little, each fore tarsus armed with a small tooth. Wings reaching to seventh abdominal segment. Fore wings with three stout transparent spines having dilated tips on anterior margin near base, with a slight constriction near the middle, and eight to ten double fringe hairs on posterior margin. Hind wings about one-third narrower.

Abdomen elongate, segments two to seven of equal width, eight and nine reduced, tube slender, two-thirds as long as head.

Male allotype: About as large as and colored as in female except that the body is a little lighter and the fore femora yellow to yellowish brown in distal portion and all tibiae yellowish with middle and hind tibiae slightly brown in the middle.

Cheek spines stronger, all prominent dilated head and body spines longer, especially the postoculars (63 m.) those on anterior angles of prothorax (75 m.), and mid-laterals (66 m.); those on posterior angles of prothorax 66 m., on prominent coxae 30 m.; on margin of fore wings near base 45, 27 and 78 microns. Fore femora greatly enlarged, tarsal tooth stronger. Abdomen reduced in size gradually from segment two to tip.

Larvae are translucent yellowish white with antennal segments three to seven gradually shading from brown to dark brown, tube brown. Pupae are colored like the larvae but without deep brown on antenna and tube.

Described from thirteen ♀ and fourteen ♂ specimens taken under the bark of a dead *Acacia koa* tree by Mr. O. H. Swezey at Olinda, Maui, T. H., in October, 1926. Holotype and allotype in author's collection; paratype deposited in the collection of the Hawaiian Entomological Society, Honolulu, T. H. (Moulton No. 1445.)

This species should be classified in Priesner's key (Ref.: Priesner, 1923, Thysanoptera of Surinam, p. 102) under the subgenus *Phlocothrips* and near the species *salicinus* Pr., found in Austria.

List of Thysanoptera Known from the Hawaiian Islands.

TEREBRANTIA

Family ÆOLOTHRIPIDAE Haliday, 1836

Aeolothrips fasciatus (Linn.), 1761.

Host: *Cyathodes tameiameiae.*

Family THRIPIDAE Uzel, 1895

Subfamily HELIOTHRIPINAE Karny

Heliothrips haemorrhoidalis Bouche, 1833.

Host: Croton leaves, Fuschia, *Metrosideros polymorpha* and other plants.

Subfamily CHIROTHRIPINAE Karny

Limothrips cerealium Halid. 1836.
Host: Various grasses.

Chirothrips mexicanus Crawford, 1909.
Host: *Chloris paraguayensis, Eragrostis variabilis.*

Subfamily SERICOTHRIPINAE Karny
Tribe ANAPHOTHRIPINI Priesner

Anaphothrips (*Chaetanaphothrips*) *orchidii* (Moulton), 1907.
Host: *Commelina nodiflorum.*

Anaphothrips (*Anaphothrips*) *swezeyi* Moulton, n. sp.
Host: *Chaetochloa verticillata* and *Panicum torridum.*

Subfamily THRIPINAE Karny

Scolothrips sexmaculatus (Pergande), 1894.
Host: *Psidium* sp.

Frankliniella flavens Moulton, n. sp.
Host: Young corn plants.

Taeniothrips hawaiiensis (Morgan), 1913.
Host: Flowers of roses, cotton, *Psidium* sp., *Hibiscus* (wild), Aster, Canna, Lantana and *Ipomoea insularis.*

Thrips (*Ctenothripella* Pr.) *abdominalis* Crawford, 1910.
Host: Flowers of Aster, *Verbesina encelioides* and Lantana.

Thrips tabaci Lind., 1888.
Host: Flowers of Aster, *Ipomoea insularis* and roses.

Thrips saccharoni Moulton, n. sp.
Host: Sugar cane, in the spindle.

Isoneurothrips antennatus Moulton, n. sp.
Host: *Metrosideros polymorpha.*

Isoneurothrips dubautiae Moulton, n. sp.
Host: *Dubautia* sp.

Isoneurothrips fullawayi Moulton, n. sp.
Host: *Broussonetia papyrifera.*

Isoneurothrips multispinus (Bagnall), 1910.
Host: Unknown.

Isoneurothrips williamsi Moulton, n. sp.
Host: Unknown.

Selenothrips rubrocinctus (Giard), 1913.
Host: Mango and Croton leaves.

TUBULIFERA

Family PHLOEOTHRIPIDAE UZEL, 1895.

Subfamily PHLOEOTHRIPINAE Priesner

Tribe HOPLOTHRIPINI Priesner

Agnostochthona alienigera Kirkaldy, 1907.
Host: Under the bark of a dead tree.

Dermothrips hawaiiensis Bagnall, 1910.
Host: Under the bark of a dead Suttonia tree.

Dolerothrips angusticeps Bagnall, 1910.
Host: Unknown.

Dolerothrips barbatus Bagnall, 1910.
Host: Under a decayed log.

Dolerothrips bicolor Bagnall, 1910.
Host: Unknown.

Dolerothrips dubius Bagnall, 1910.
Host: Unknown.

Dolerothrips flavipes Bagnall, 1910.
Host: Under bark.

Dolerothrips intermedius Bagnall, 1910.
Host: Unknown.

Dolerothrips lanaiensis Bagnall, 1910.
Host: Unknown.

Dolerothrips ovatus Bagnall, 1910.
Host: Unknown.

Dolerothrips perkinsi Bagnall, 1910.
Host: Unknown.

Hoplothrips flavitibia Moulton, n. sp.
Host: Under the bark of dead trees and from old borer tunnel in dead Suttonia trees.

Hoplothrips laticornis (Bagnall), 1910.
Host: Unknown.

Hoplothrips mauiensis Moulton, n. sp.
Host: Under bark of dead koa tree.

Hoplothrips nigricans (Bagnall), 1910.
Host: Unknown.

Hoplothrips swezeyi Moulton n. sp.
Host: In dead wood of Pipturus, Suttonia, and dead stems of *Rubus hawaiiensis*.

Macrophthalmothrips hawaiiensis Moulton, n. sp.
Host: Under the bark of a dead koa tree.

Nesothrips oahuensis Kirkaldy, 1907.
Host: Probably on flowers (per Kirkaldy reference).

Oedemothrips laticeps Bagnall, 1910.
Host: Unknown.

Tribe HAPLOTHRIPINI Priesner

Haplothrips fusca Moulton, n. sp.
Host: *Batis maritima* flowers.

Haplothrips gowdeyi (Franklin), 1908.
Host: Flowers of cotton, *Leucaena glauca, Panicum torridum, Verbesina encelioides,* Canna, Lantana, *Vernonia cinerea, Emilia sonchifolia* and cockscomb.

Haplothrips usitatus (Bagnall), 1910.
Host: Hilo grass (*Paspalum conjugatum*).

Kentronothrips hawaiiensis Moulton, n. sp.
Host: Sugar cane, beneath leaf-sheaths.

Mesothrips setidens Moulton, n. sp.
Host: Unknown.

Tribe PHLOEOTHRIPINI Priesner

Phloeothrips mauiensis Moulton, n. sp.
Host: Under the bark of a dead koa tree.

Subfamily MEGATHRIPINAE Priesner
Tribe COMPSOTHRIPINI Priesner

Diceratothrips brevicornis Bagnall, 1910.
Host: Unknown.

Some remarks on function as a base for classification and its relationship to form

BY F. MUIR

(Presented by O. H. Swezey at the meeting of February 2, 1928)*

In the classification of living organisms the primary divisions can be stated in terms of function as well as in terms of form. Plants and animals; vertebrates and invertebrates; cold and warm blooded animals; mammals and non-mammals; fishes and birds; all these can be differentiated in terms of function as well as, or, in some cases, better than, in terms of form or morphology. As we descend to the secondary and lower divisions form becomes apparently of more and function of less account, mostly because of our ignorance.

When we take a group of animals like the insects we find the same conditions. The higher divisions can be stated in terms of function but the lower divisions can not.

In the early days of entomology, when the foundations of our present classification were being laid, systematists were morphologists, or they used what knowledge of morphology was then available, and morphologists studied function as well as form. Thus they noted whether insects could fly or not, whether by one pair or wings or two, whether one pair functioned for some other purpose than flight such as covers or "balancers." The mouth-parts were recognized as functioning for gnawing or sucking, and the various ways of sucking were considered. Thus function was just as important as form and the classification thereon erected has proved to be very workable, and, on the whole, quite natural.

With the increased facilities for travel and the increased interest in natural history, systematists were swamped with material. Their task of classifying, naming and describing their collections was enormous and under the pressure they cut down their morphology to the least possible compatible with their object, and they stereotyped their terminology. Morphology, being divorced from systematics, also found itself overloaded with material. Morphologists

* This paper was intended for the meeting of December 1, 1927, but there was a delay in receiving it from Mr. Muir, in England at the time. [EDITOR.]

forgot function and settled down to compare sclerites through long series. Neither systematists nor morphologists can be blamed, it was the result of circumstances which were impossible or hard to avoid.

While exceptions can be found to the above statements, as they can to most generalizations, yet the above represents the tendency in insect systematics and morphology over a considerable period and the results can be traced in much of our systematic work today.

If we wish to improve our classification, especially the subordinate divisions. I believe that we must broaden the morphology used in systematic work and associate it with function. Towards this end the organs composing the genitalia, especially in the male, will prove to be of much greater value than has been generally recognized. In saying this I do not belittle the good work already done along this line, but I wish to insist that considerably more can be done.

Our knowledge of the morphology of the genitalia of insects is still very slight but our ignorance as to their functions is nearly complete. It is therefore impossible to draw any generalizations on a broad basis. My own knowledge of these matters is chiefly confined to the Coleoptera and the Hemiptera so I must deal chiefly with those orders. Fortunately they represent two types which in many respects offer striking differences in form and function.

In the Hemiptera we have an arrangement of genitalia which we can call "exposed." The tenth and eleventh abdominal segments are small, the ninth (perhaps in conjunction with other units) forms a large ring segment (pygofer). From the membrane between the eighth or ninth segment and the tenth arises a median aedeagus and a pair of genital styles (claspers or parameres). These three organs, while internally arranged for coordinated movement, are never consolidated into a single structure. While the genital styles are often large and cover the opening of the pygofer, and while in some Homoptera structures from the ventral margin of the pygofer (genital plates) more or less cover the genital styles as well as the opening of the pygofer, the genitalia are never withdrawn into an invagination and enclosed therein while at rest. It is unfortunate that some Homopterists

have referred to the aedeagus and genital styles as internal because they are covered by the genital plates. This type of genitalia is found in Lepidoptera and Trichoptera, but it is possible that further study of the development will show that the details of the structure are not homologous in all cases.

In the Homoptera the pygofer is fastened to the eighth segment by a very short membrane, and, in some cases, the eighth segment, especially the sternite, is amalgamated with the pygofer, preventing it from twisting. The genital styles, often in conjunction with the anal segments (10 and 11), form clasping organs which prevent the male from twisting round on the aedeagus. In copulation the male rides the female; when the ovipositor is large the base of the oviposter and the gonopore are some distance from the apex of the body and the male has to pass his abdomen down the side of the female (false male vertical pose), but when the ovipostor is short or rudimentary (as in the majority of Fulgoroidea) the abdomen of the male passes over the apex of the abdomen of the female (male vertical pose). Owing to the absence of any provision for a twist the male cannot leave the female and take up an end to end position, but simply remains holding the female with his claspers while his body takes up a position at an angle of between 50 to 150 degrees to the female. The aedeagus in Homoptera is of two types. In one it is tubular, in some cases being divided into a basal and an apical portion; in the other type (certain Fulgoroidea) the basal portion is large and the apical portion is drawn within it. In the tubular type there is generally a modified portion of the ejaculatory duct which can be everted by blood pressure, and forms the chief intromittent organ. If we understood the functioning of these two types, we might be in a better position to explain the causes which led to the modifications. That the tubular type is the more primitive is demonstrated by several lines of evidence. While there is some evidence to indicate that there may be a correlated differnce in the female, our knowledge of the ovipositors is too limited to allow of a generalization.

Turning to the Heteroptera we find the same fundamental type as in the Homoptera, but with certain distinct specialisations. Here we find the pygofer (9th abdominal segment) to be comparatively small, the eighth abdominal segment is also small and attached to the pygofer and to the seventh abdominal segment, by

large membranes which allow a twist of the pygofer through 180 degrees. So far as I am aware the Heteroptera always take up a male vertical pose and later the male lets go of the female and takes up an end to end position with an inverted pygofer. While this is common to the vast majority of the Heteroptera there may be exceptions especially among the water bugs, and a study of these may indicate the line of evolution of this specialisation. That the Homopterous form is the more primitive is evident from several lines of evidence. In those cases among the water bugs where the male takes up a position alongside the female it is probable that they both take part in progression, a thing they cannot both do in an end to end position.

In a comparatively few Heteroptera the aedeagus is small and tubular and the internal sac is very little differentiated; in the majority the aedeagus is large, and the internal sac is large and complex, often with a large flagellum. The large, complex internal sac acts as a clasper and where it is found the external clasping appendages are never very large or very complex, and the time occupied in copulation is generally long. Thus in the Heteroptera the genital styles or claspers are never as large as in most Fulgoroidea and the time occupied in copulation is longer. The end to end position with the inverted pygofer may be an adaptation due to the longer period of copulation. This again may be related to a more complete and direct connection between the testes and the spermatheca, and so be a saving of material to the species, and be bound up with the physiology and metabolism of the insect. Another important point is that once copulation has started the insect should be able to fly, hop or crawl away from danger without uncoupling. In the Homoptera the paired couple hop away and alight nearby still attached together; if there was no adequate means of clasping externally as by genital styles and anal segment, then the jerk caused by the sudden springing away would place a severe strain upon the aedeagus. In the Heteroptera the slower movement involved in flight or crawling would not cause such a sudden jerk, but would cause a more continuous strain, and the development of the internal sac, the end to end position, and the twist of the pygofer may be adaptations to meet these conditions.

In Orthoptera where the formation of the individual spermatophore takes some considerable time, the time occupied by copu-

lation is also very lengthy. There is no internal sac and the clasping organs are very poorly developed. Since the spermatophores are formed and passed one by one into the female there is no need for a continuous conduit from testes to spermatheca. Thus it can be said that the actual copulation—the passing of the spermatophore from male to female—is repeated many times and so the pose (usually male vertical or false male vertical) is retained all the time. Under these conditions complex clasping organs are not necessary for should the pairing insects have to move away it is not of great importance if the act of copulation is discontinued for a short time.

It must always be borne in mind that adaptations for "pose" may have no relationship to "position" and when dead insects in copula are studied they are nearly always in "position." When copulation takes but a very short time, as with many Hymenoptera, then there is a pose, generally the male vertical or false male vertical, but no position. Position is an adaptation to a lengthy copulation and the nature of the position is one of convenience, adaptation to habitat, etc.[1]

One is tempted to go into further details, such as the absence of genital styles in all the Cicadidae except one genus, and its probable relationship to function, but until more data are accumulated it is better to refrain.

Turning to the Coleoptera we find a totally different condition, in which the genitalia, when at rest, can be described as "hidden." The apical segments of the abdomen, the eighth or ninth, tenth and eleventh are withdrawn into a cavity, a pseudocloaca, the apex of the abdomen being formed by the meeting together of the hind margins of the eighth or seventh tergites and sternites. The genital styles (lateral lobes, parameres) are dissociated from the abdominal sternite and are in intimate association with the median lobe (penis). In most forms there is a development of a large sclerite (basal plate) to which the lateral lobes are often articulated. The whole makes a very compact aedeagus which is attached to the body wall by a large membrane. The invaginated abdominal segments are greatly reduced and dechitinized. The withdrawal of the male genitalia into a pseudocloaca is also found among the

[1]Many mammals have a male vertical pose and an end to end position.

Orthopteroid forms, and in those forms having reduced ovipositors the females also have a similar arrangement (ie. e. Blattidae).

In the exposed forms mentioned above the well-developed ring-like pygofer, the large genital styles and the genital plates form ample protection to the primary organ of copulation, the aedeagus in the free, exposed lives they lead. It is interesting to note that in the Coccidae where the abdomen is considerably flattened horizontally, the ring-like pygofer has disappeared and the aedeagus is more or less protected by being partly withdrawn into the abdomen. It is possible that hidden genitalia were originally associated with a cryptic habit of the insect, hiding under bark, in dirt, etc., where exposed genitalia would be a disadvantage. It leads to complete protection.

Coleoptera take up the male vertical pose, often followed by the end to end position, with a twist of 180 degrees at the base of the aedeagus, which is made possible by the large membranous connection between the aedeagus and the body wall. When the aedeagus is curved, either dorsally or ventrally, it must lie on its side when at rest. In some cases (i. e. Dytiscidae, Scarabaeidae) while it lies on its side during repose it does not return to the normal position during use, but continues the twist through 180 degrees.

So far as we know at present the three families, Dytiscidae, Haliplidae and Pelobiidae, differ from all other Coleoptera in the form of the median lobe which is funnel shape. It was suggested that they must function differently to others, and it has been shown that this is so in Dytiscidae. In this family the funnel shape lobe serves to hold the large spermatophore while the sperm is transferred to the female through a hole in the spermatophore. As the structure of the median lobe is the same in the three families it is highly probable that they all function in a similar manner. In the vast majority of Coleoptera the median lobe is tubular or a development from the tubular, and there is an internal sac which is evaginated during copulation. In the majority this sac is large and complex, and the lateral lobes seldom, if ever, serve as claspers but only as guides or organs of touch.

In the Carabidae we find the basal piece absent; in the Cicindelidae it is represented by a small sclerite. It appears probable that the former is the more primitive condition. In the Scara-

baeidae we can follow the reduction of the median lobe to a mere membrane and the development of an enormous and complex internal sac, along with a reduction of the lateral lobes and a great development of the basal plate. This latter serves as a protection to, and a foundation for, an elaborate muscular bulb for the evagination of the internal sac. In the Staphylinidae we can follow the tubular median lobe with fairly well developed lateral lobes and small internal sac, through gradate series to a wonderfully constructed bulb for the evagination of a complex sac, and the reduction of the lateral lobes. In the Phytophaga and Rhynchophora we have a ring shape tegmen with lateral lobes attached to it; the median lobe is tubular, long, attached to the ring shape tegmen by a long membrane which allows considerable movement of the median lobe through the ring tegmen. In these groups we find gradate series showing the loss of the lateral lobes and the reduction of the ring to a Y shaped piece and even to a mere rod. The internal sac is well-developed. These gradate series give joy to the evolutionist as much as they give sorrow to the systematist.

The Odonata form one of the most isolated orders among insects. They can be recognized by almost any part of their structure, not only in the adult but also in the young. In nothing do they differ more from other insects than in the form of the male genitalia and their method of copulating. The normal male genitalia are reduced to mere rudiments or are even absent and an intromittent organ, unique among insects, has arisen upon the ventral surface of the second abdominal segment. As the male gonopore is situated in the normal position at the end of the abdomen it is necessary for the insect to curve its abdomen under and charge this intromittent organ with sperm. The male then seizes the female by the back of the head or by the pronotum by means of claspers at the apex of his abdomen and carries her about in "tandem." This position allows both individuals the full use of their wings and offers less resistance. It is then necessary for the male and female to curve their abdomens ventrally so as to bring the end of the female abdomen in contact with the male intromittent organ, making a complete circle. In cases which I have watched where this is done while the male rests upon a suitable surface, the pendent female is swung backward and forward till she curves up her abdomen in the desired method. If a

slight wind is blowing it is often impossible for copulation to take place as the long thin female hanging from the long thin male gets carried slightly sideways and she misses the mark each attempt.

How such a unique structure arose or how such a strange departure of function took place we can only guess, as we have no data upon which we can build a probable theory.

These insects are true children of the air and no other insects have such a complete command of flight, or turn and twist on the wing so quickly. They are the swallows of the insect world. This is necessary for the capture of their prey. Their whole structure is to this end—the large wings supported by numerous veins, the large thorax and battery of muscles, the large eyes and jaws, the long slender abdomen. If they assumed the male vertical pose they would have to do so while at rest, and even then it would most likely be necessary to assume the false male vertical pose, as with such a long slender abdomen it would be difficult for the male to curve it over the tip of the female's. But this would necessitate rest, which, to such children of the air, is not congenial. Any of the usual poses and positions would have hampered their flight. They have solved their problem along a unique path, but from the point of view of evolution we are totally in the dark as to the stages by which they attained their end. It is possible that at first a spermatophore was deposited in a groove on the second abdominal segment, such as is found in some ant lions, but the stages along which the unique intromittent organ developed are unknown. So far neither comparative morphology nor development has thrown light on this subject.

In the Diptera we have some very interesting conditions which have been described by several workers. Unfortunately we do not know as much about the comparative morphology and mechanics of the male genitalia of Diptera as we do about those of Coleoptera and Hemiptera. Among them we find a number of cases in which the genital segments, and often some of the others, take up a twist of 180 or 360 degrees as soon as they leave the pupa, thus we have a prearranged condition connected with the act of copulation. Interesting as are these cases of a pre-copular twist they are not more so than any other structure for certain end. The modification of the eighth abdominal segment in Heteroptera and its attachment to the preceding and succeeding segments is equally

a pre-copular arrangement for similar ends. The genitalia are all developed before they are used, like all other organs.[1]

The false male vertical pose seems to be common among these flies and the inverse and circumverse genital segments may be an an adaptation for that pose, and the whole may be bound up with the length and slenderness of the abdomen. In insects with a wide, flat abdomen, such as in most beetles and in the Blattidae, the pose is the male vertical, whereas in many cases where the abdomen is long and comparatively slender, as in many Acridiidae, etc., it is the false male vertical.

In the wingless Diptera (i. e., Nycteribiidae) and in some Diptera which pair while at rest, the clasping organs are small or absent, whereas those with active flight which pair on the wing the claspers are generally large and complex. So far no case of a complex, large internal sac has been reported in Diptera and copulation generally takes but a comparatively short time.

A review of all the orders of insects, even in the above cursory manner, would be a large task, even with our present limited knowledge. The above I hope will be enough for the thesis in view, viz., that a better knowledge of the form and function of the genitalia of insects will enable us to understand much better their evolution, relationship to one another, and therefore enable us to rest their classification upon a more scientific basis than at present is possible in many groups.

It is impossible to leave the subject without touching upon certain speculations. Is the great diversity found in the genitalia among many allied species "many keys to open a single lock" or is there always some correlated female difference? This requires much more evidence than we possess at present before it can be answered with any certainty, but in cases studied by myself there are such correlated differences. The genitalia are as important for the race as the mouth parts are for the individual; whatever changes have taken place all down the ages in their form we can be sure no break has ever occurred in their function. Large mutations are therefore unlikely to have been preserved in one sex without co-ordinate mutations in the other. Wherever we find several distinct types in an order, functioning along distinct me-

[1] This phenomenon is bound up with the Biogenetic law where characters are pushed back to earlier stages.

chanical principles, we can be sure that they arose, and were developed to perfection, in response to urgent mechanical necessities. They were not sudden, large morphological mutations which the organism had to make the best use of that it could. Equally improbable does it appear to me that a long series of small mutations, every one of which must be co-ordinated to the others, arose through the shuffling of the genes, quite irrespective of the biology of the insect or of its necessities. This leads to the question as to which came first, function or form, a question which we can debate about it and about, and come out at the same door as we went in.

Environment, in its widest sense, is the great potter's thumb which has shaped the organism; function or the urge to function, is the motive power that drives the wheel. The forest-loving, slow moving five-toed animal evolved into the prairie-loving, quick-moving one-toed animal parallel with geological changes from forest to open country. If the original five-toed animal had not been forced by its environment to move quickly over hard ground, or to feed on grass instead of on leaves, would its form have been modified? The same can be asked of the different animals, unrelated to one another, that have taken to desert life and assumed similar form. The camel's foot could never have arisen if its ancestor had lived on wet, hard land; it had to take to the sandy lands before the foot could be adapted to it. In all these cases the animal had to begin to function before the change of morphology could take place. This is quite irrespective of whatever views we hold as to the causes of the morphological changes.

In discussing insects on small islands it has been put forward that an increase of the size of the wings would be of advantage and therefore any small increase would be conserved by natural selection. Such an increase would be of little use unless it was accompanied by an increase of muscular power to work the wings; this would require a larger thorax and apodemes, a different proportion in the size of the thoracic sclerites, and an alteration of the nerves working these muscles. If this process was carried far it would necessitate an alteration of the position of the coxae, and, if carried still further, might involve an alteration of the shape of the abdomen on account of weight. It is difficult to say how many factors would have to be altered in the shuffling of the genes to bring all this about, or what are the odds that such changes would

all appear in due sequence and co-ordinated. In the case of the reduction of the size of the wings a parallel set of changes in the reverse direction would be necessary, and here again co-ordinated changes in right sequence would be just as necessary. More complex cases can easily be conceived. To me some co-ordinated mechanism of growth is necessary, which must have some relation to use and disuse; no blind shuffling of the genes at maturation and fertilization, quite irresponsive of the activities of the animal, can satisfy the needs of the situation.

The factors causing and guiding changes in organisms are numerous, and those responsible for the main lines of evolution, for the co-ordination of the various parts, and for the wonderful adaptations of the organism to its environment, are not likely to be the same as those causing most of the speciation. Personally, I have often thought that had Darwin called his great work "Evolution by natural selection," and not placed stress upon speciation by natural selection, it would have presented a better balanced picture.

While some of the minor differences found in the genitalia of closely allied species may be merely speciations, the more fundamental differences, often based upon different mechanical principles, appear to me to be adaptations in response to functions due to differences in habits, form, environment and, in some cases even to psychology.

Thysanuran Predatory on Eggs and Immature Forms of Termites in Borneo

BY C. E. PEMBERTON

(Presented at the meeting of March 3, 1927)

During examinations of termite-mounds and termite-galleries in logs near Sandakan, British North Borneo, in January, 1927, a small Thysanuran resembling Lepisma was frequently encountered in close association with the termites. Some of these were removed to glass tubes containing decaying wood with eggs, nymphs, workers and soldiers of termites (Termes and Capritermes sp.). During three weeks of observation it was found necessary to add more living termite material several times. The Thysanurans remained active and appeared to increase somewhat in size. Each time, after inserting fresh eggs and termites to the tubes, the Thysanurans could be observed, beneath a hand lens, feeding on the eggs and soft, immature, helpless termite-nymphs. To pierce an egg or penetrate the integument of a nymph required considerable active gnawing. As soon as the mandibles broke through the egg-membranes the juices were quickly consumed, leaving nothing but the collapsed shell. Nymphs were similarly drained of their body fluids. Disturbed Thysanurans, while feeding, would actively dart about the tubes carrying their prey with them, sometimes dropping this to return again and continue feeding.

The extreme rapidity of movement in these insects enables them to live amidst active termites without danger of injury by the workers or soldiers.

This Thysanuran was observed especially within the channels in dead wood made by species of Termes. It was brought alive to Honolulu but only one individual survived the journey. The termites in the containers were all dead at least a week before arriving. In Borneo it did not appear to be sufficiently abundant to operate, in itself, as an effective element in termite control. It may perhaps be suppressed there by obscure factors which were not observed.

Nematodes Associated With Termites in Hawaii, Borneo and Celebes

BY C. E. PEMBERTON

(Presented at the meeting of April 7, 1927))

During investigations of natural enemies of the sugar cane borer, *Rhabdocnemis obscura* (Boisduval) in the East Indian Archipelago, 1926-1927, opportunity was had to examine termite communities for parasites in Celebes and North Borneo. Certain nematodes were often found abundantly present within termites collected on both islands, and subsequently in Hawaii also; but only in small numbers. As nematodes have in some cases been recorded as fatally parasitic on certain insects, including termites, the following information is given for what interest it may have.

In North Celebes nema were found within the mouth-cavity of *Neotermes, Coptotermes, Microcerotermes* and *Termes* species. About one-quarter of the individuals examined were infested. The nema were not abundant. Rarely more than ten were found within a head. These were more commonly found within the heads of workers. No nema were found in species of *Nasutitermes* and *Cryptotermes.* An abdominal nematode lying outside the intestine occurred in small workers of one species of *Termes;* usually from 1 to 4 individuals per termite. About one-third of the small workers of this species were infested.

In North Borneo head-inhabiting nematodes were commonly found in the mouth-cavity of 2 species of *Coptotermes;* 3 species of *Capritermes;* 2 species of *Microcerotermes;* 2 species of *Termes;* 3 species of *Rhinotermes;* 1 species of *Neotermes;* 1 species of *Macrotermes* and 3 species of an undetermined genus. They were not found in 1 species of *Cryptotermes;* 1 species of *Hospitalitermes* and 3 species of *Nasutitermes.* In the case of the large, mound-building species of *Macrotermes,* the head-infesting nema were not numerous, but in all of the others, where found, they were often abundant; there sometimes being 20 nema to a head. No abdominal nema were found in Borneo.

The nema occurring in termite-heads, both in Celebes and Borneo, were always immature. Their average length was about .25 mm. Maturity appears to follow the death of the termite; for full-grown individuals were only found in dead termites. Dr. G.

Henderson of the Experiment Station, H. S. P. A., has examined these and determined them as a species of *Rhabditis*.

Nema were especially numerous in the workers of all species of *Capritermes*. Mounds of these were frequently found completely vacated. Being otherwise undisturbed in the forest, it seemed possible that such colonies had been wiped out by accumulations of nema. Nema-infested *Capritermes* were brought to Honolulu from North Borneo. The termites all died en route within 2 weeks. The nema survived and were found numerous within the heads of the dead termites.

It is probable that wet conditions favor these nema. Examinations in Celebes were made at the close of the annual 6 months' dry season, while the Borneo studies were made at the height of the wet season.

Dissections of *Neotermes connexus* Snyder, a supposedly Hawaiian termite, revealed nematodes in the heads of workers. They are uncommon, however. Rarely more than one nematode per head occurred in the examinations, while the percentage infested is low. Dr. Henderson finds this to be a species of *Rhabditis* also.

Examinations of *Coptotermes formosanus* Shiraki and *Cryptotermes piceatus* Snyder, collected in Honolulu showed no nematode infestation.

The presence of nematodes within heads of termites has been observed by others. Of particular interest are the observations of Merrill and Ford[1] who found head-inhabiting nema in *Leucotermes lucifugus* Rossi in Kansas. This nematode was described by Cobb as *Diplogaster labiata* n. sp. They found that where infestation was heavy the termites often died and under culture nema infestation could in 12 days time become so heavy as to kill all termites under observation.

On October 25, 1926, termites bearing the abdominal nematode were shipped from Macassar, Celebes. The nema reached Honolulu alive some six weeks later. Mr. Muir and Dr. Henderson were able to breed this in quantity in culture. Large numbers of them were placed in soil infested with *Coptotermes formosanus* in one spot in Honolulu. A quantity was also placed with *Coptotermes* in soil in a large glass jar containing wood. During April,

[1] Merrill and Ford, Journal of Agricultural Research, Department of Agriculture, Washington, D. C. Vol. VI, No. 3, April, 1916.

1927, the writer has dissected open many termites from both places; but in no single instance has a termite been found containing nema.

Attempts to inoculate *Coptotermes* in Honolulu with the head-inhabiting nematodes from Borneo have so far given negative results also.

Bees of the Genus Perdita in the J. C. Bridwell Collection (Hymenoptera)

BY P. H. TIMBERLAKE

Citrus Experiment Station, Riverside, Calif.

(Presented by O. H. Swezey at the meeting of December 1, 1927)

The bees of the genus *Perdita* Smith recorded in this paper are contained in the collection of J. C. Bridwell, which is housed at present in the Bishop Museum at Honolulu. The collection contains a considerable number of species from Southern California, which will be considered in my forthcoming study of the Californian species of the genus. The remainder of the collection, consisting of fourteen species, collected east of the Rocky Mountains, will be considered here.

1. **Perdita octomaculata** (Say).

   8 females, Pelham, New Hampshire, Aug. 18 and Sept. 19-20, 1905 (Bridwell).

2. **Perdita tridentata** Stevens.

   9 females, 27 males, on *Helianthus petiolaris* Nutt., Clay Co., Kansas, Aug. 1901 (Bridwell).

3. **Perdita bruneri** Cockerell.

   2 females, on *Helianthus petiolaris* Nutt., Clay Co., Kansas, Aug. 1901 (Bridwell).

4. **Perdita nebrascensis** Swenk and Cockerell.

   4 males, Clay Co., Kansas, Aug. 1901 (Bridwell).

5. **Perdita crotonis** Cockerell.

   3 males, on *Croton texensis* (Klotzsch), Clay Co., Kansas, Aug. 1901 (Bridwell).

6. **Perdita maura** Cockerell.

   21 females, 7 males, Clay Co., Kansas, Aug. 1901; and 1 male, Baldwin, Kansas, June (Bridwell). These specimens bear an old manuscript name indicating that they were collected on Physalis.

7. **Perdita wootonae** Cockerell.

1 female, on Mentzelia, Denver, Colorado, July 20, 1897 (Dunning).

8. **Perdita zebrata** Cresson.

3 females, 3 males, on Cleome, Denver, Colorado, July 20, 1897 (Dunning).

9. **Perdita albipennis** Cresson.

1 female, on *Helianthus petiolaris* Nutt., Clay Co., Kansas, Aug. 1901 (Bridwell).

10. **Perdita lacteipennis** Swenk and Cockerell.

4 females, 19 males, on *Helianthus petiolaris* Nutt, Clay Co., Kansas, Aug. 1901 (Bridwell).

11. **Perdita bequaerti** Viereck.

1 female, 2 males, Griffin, Georgia, Sept. 1902 (Bridwell).

12. **Perdita isopappi** n. sp.

This is the *Perdita bishoppi*, var. (or *ignota?*) Cockerell, 1906, Entomologist, 39, p. 149. Dr. Cockerell has sent me the specimens that were described in the Entomologist and I have received other specimens from Dallas and Handley, Texas, from the National Museum. In the Bridwell collection I found one female from Willis, Texas. A study of these specimens convinces me that *isopappi* is distinct from *P. bishoppi* Ckll., *P. ignota* Ckll. and from *P. crawfordi* Ckll. The female of *isopappi* differs from *bishoppi* by the milky hyaline wings with colorless veins, the whitish tarsi, the larger white marks on tergites 2 and 3 (absent in typical *bishoppi* although linear basal marks sometimes occur in that species), the scape more or less whitish beneath, the pygidium much narrower and retuse at apex, etc. It is very similar to typical *crawfordi* from Nebraska, but head and thorax are a bluer green, the lateral face marks much smaller, occupying not more than one-half the space between clypeus and margin of eyes, the abdominal marks reduced, more linear, interrupted and absent on tergite 3. From typical *ignota* from Mesilla, New Mexico, it differs at once by the finely tessellate and consequently a little duller mesoscutum.

The male of *isopappi* is most similar to *crawfordi* but is more bluish and has the lateral face marks reduced to a small spot next to the clypeus. In *crawfordi* the cheeks usually have a large blunt

tooth anteriorly; in *isopappi* the cheeks are simple or provided with a very small inconspicuous tubercle. In the male of *bishoppi* the subcosta and margins of stigma are decidedly darkened, and the mesoscutum is more strongly tessellate and duller. The true male of *ignota* is apparently unknown; Colorado specimens recorded as *ignota,* including males, from Boulder, Golden, etc., I would classify as *crawfordi,* on account of the tessellate mesoscutum in the female, but I have seen a typical *ignota* female from Glenwood Springs, collected by Herbert E. Schwarz. The genitalia of *bishoppi, crawfordi* and *isopappi* are much alike but there are some differences which seem to be good.

MALE

Head not enlarged, somewhat wider than long and well rounded on sides and above. Cheeks rather narrow, simple, or with a very small inconspicuous tubercle anteriorly. Disk of clypeus somewhat broader than high, convex and well rounded above; lateral extensions distinct and rather broad at inner ends, but becoming much inflexed and very narrow toward mandibles. Lateral plates of face considerably wider below than at level of antennal sockets, and at level of the dog-ear plates occupying distinctly less than one-fourth the total width of face. Prominence between antennal sockets low, convex, not carinate medially but wth a fine median impressed line, which reaches half way from a point opposite the middle of the antennal sockets to the anterior ocellus. Mandibles moderately long, tapering, simple and very acute at apex, but a little expanded on inner margin near middle and distinctly expanded at base on outer margin. Antennae short, the flagellum stout and clavate, its joints, except the last, all wider than long. Abdomen broadly ovate, broadest across the third segment, rather less than one-half longer than wide, convex above and with the apex hardly recurved. Membrane of wings with very fine, short, microscopic setae, which are denser in the apical field; stigma ordinary in width, about as long as first submarginal cell and emitting the radius at the middle; marginal cell somewhat shorter than stigma, almost squarely truncate at apex and with the substigmatal part much longer than the poststigmatal part; second submarginal cell narrowed about one-half to the marginal, receiving the first recurrent vein a short distance from base and the second at apex; second recurrent and subdiscoidal veins obsolete. Claws cleft not quite to the middle, and with the inner tooth a little shorter than the outer.

Frons and face smooth and polished, the frons with a few widely separated, very fine but distinct punctures. Vertex finely but strongly tessellate and rather dull. Cheeks more delicately tessellate than vertex, somewhat shiny, indistinctly punctured, and smoother next to the eyes. Thorax throughout finely tessellate and rather shiny, the tessellation more delicate on disk of mesoscutum; mesoscutum and scutellum with sparse, very fine and not very distinct punctures. Abdomen microscopically tessellate and shining. Pubescence white, erect, moderately long and coarse, abundant but not dense, a little longer and denser on cheeks than elsewhere and conspicuous on face and mesonotum, where it is rather uniformly distributed.

Head and thorax dark bluish green, varying to a decided dark blue color. Mandibles, except clear red apices, labrum, clypeus, except the usual pair of dark dots, and lateral face marks creamy white. Lateral face marks restricted to a small spot at each side of clypeus and widely separated from eye margins. Thorax entirely dark, or sometimes the apex of tubercles are slightly whitish and sometimes two small transverse whitish marks occur on the posterior margin of pronotum. Abdomen uniformly dark brown to piceous, without pale markings but with the rather broad apical margin of tergites whitish hyaline and the last segment pale yellowish; venter similar to the tergum but with the hyaline margins less conspicuous. Legs piceous, but apex of femora, very narrowly on middle and hind pair, front tibiae except behind, base of middle and hind tibiae and all the tarsi very pale yellow or creamy white, the front tibiae being a little yellower and middle and hind tarsi whiter than the other parts. Labio-maxillary structure dark brown. Scape, pedicel and first two or three joints of flagellum creamy white beneath, the scape and pedicel otherwise brownish, and the flagellum brownish ferruginous, slightly darker above and paler beneath. Tegulae almost perfectly hyaline except a whitish spot at base. Wings milky hyaline; subcosta and margins of stigma slightly yellowish and the remainder of venation colorless.

Length about 3.0-3.5 mm.

FEMALE

Similar to the male in many respects. Head a little broader than long, gently rounded on sides and above. Clypeus convex, strongly projecting in front of ocular line, the upper margin of disk well rounded, the lateral extensions very strongly inflexed and not visible in frontal view of head. Prominence between antennal sockets rather high and rounded, the impressed median line reaching to anterior ocellus, but becoming finer above. Mandibles stouter than in the male, rather blunt at apex and with a small inner tooth. Abdomen rather broadly oval, widest across the third segment and not quite twice as long as wide; apex of pygidium moderately wide and slightly retuse. Wings as in the male except that the third discoidal cell is complete. Claws simple.

Sculpture similar to that of the male but more distinct, the frons and thorax being rather strongly tessellate and somewhat dull. Face below antennae smooth and shining. Cheeks delicately tessellate, rather shiny, and polished along orbits. Frons, mesonotum and mesopleura with fine, sparse, distinct punctures. Pubescence similar to that of the male, that on the mesonotum short, erect and conspicuous. Scopa of hind tibiae rather long and dense for a *Perdita* and carrying loose pollen; the hairs very finely plumose.

Head and thorax dark bluish green. Mandibles yellowish at base and dark red on the apical third. Labrum reddish brown. Clypeus, except usual dots, and lateral face marks creamy white. Lateral marks small, more or less circular, separated from the clypeus usually by a thin dark line and from the orbits by a much broader space. Two transverse marks on hind margin of pronotum, a similar mark at middle of anterior margin, and apex of tubercles creamy white; the tubercles, however, are sometimes entirely dark. Abdomen piceous, with apical margin of tergites 1 to 5 narrowly hyaline;

tergites 2 and 3 with a narrow basal white band, strongly interrupted in middle, not quite reaching to lateral margins on 2 and widely separated therefrom on 3; pygidium reddish; venter dark. Legs dark brown to piceous, with the front tibiae more or less anteriorly and all the tarsi yellowish white. Scape dark brown to piceous, with a whitish line beneath or white only at base; flagellum dark brown above and ferruginous to yellowish brown beneath. Labio-maxillary structure, tegulae and wings as in the male.

Length 4.0-4.5 mm.

Described from 3 females, 4 males (holotype male, allotype and paratypes) collected at flowers of *Isopappus divaricatus* (Nutt.) at Handley, Texas, Aug. 3, 1905 (J. C. Crawford); 1 female (paratype) collected at Willis, Texas, June, 1903 (Bridwell); and 1 female, 2 males (paratypes) collected at Dallas, Texas, Oct. 5, 1905 (F. C. Bishopp).

The types and most of the paratypes are deposited in the collection of the U. S. National Museum, the paratype from Willis, Texas, in the Bridwell collection and two paratypes from Handley, Texas, in the collection of the author.

13. **Perdita chrysopsina** n. sp.

Perdita halictoides Viereck, 1917, Bull. Amer. Mus. Nat. Hist. 37, p. 241 (not Smith).

The opportunity recently afforded me by Dr. Bradley to examine the Perditae in the Cornell University collection revealed two specimens from Coronado Beach, Florida, which agree perfectly with the original description of *P. halictoides* Smith and with Dr. Cockerell's notes on the type. Comparison of these specimens with the species determined as *halictoides* by Viereck shows that the latter is quite distinct although superficially very similar to the true *halictoides*. *Chrysopsina* has more or less extensive creamy white face marks, the clypeus polished and shining, the scape entirely piceous, claws simple, maxillary palpi six-jointed, etc. (*halictoides* has the face entirely dark, the clypeus distinctly tessellate, scape yellowish at base, claws with a small tooth beneath, maxillary palpi three-jointed, etc.). *Chrysopsina* in both sexes runs in Cockerell's table to *P. phymatae* Ckll., var. (couplet 51a) or to *P. californica* (Cress.) (couplet 53), but is not closely allied to either of those species. It belongs to the *ignota* group and differs from the closely allied *P. bishoppi* Ckll. by its larger size, darker green head and thorax, and by having the lateral face marks very small or absent, etc.

MALE

Head of ordinary size, distinctly broader than long, subquadrate, the margins of the occipital cavity sharply angled especially at sides. Cheeks broad, armed anteriorly with a strong laminate blunt tooth. Clypeus convex, the disk much broader than high, well rounded above, the lateral extensions strongly inflexed and not visible in frontal view of head. Lateral plates of face strongly widened below and at level of dog-ear plates each covering approximately one-fourth the total width of face. Prominence between antennae rather low, rounded, not carinate in middle, the median impressed line very fine, more obscure at middle of frons and reaching to anterior ocellus, near which it is more distinct. Mandibles long, simple, acute at apex, reaching when closed considerably beyond far margin of labrum, the base broad and abruptly contracted on outer margin about at the basal fourth, the inner margin with an arcuate expansion extending from basal fifth to a little beyond the middle. Antennae ordinary. Abdomen broadly oval or ovate, rather less than twice as long as wide, convex, the apex hardly incurved, the seventh tergite strongly narrowed to the obtuse or slightly acute apex. Membrane of wings with distinct but very fine short setae, which are denser in the apical field; stigma moderately broad, almost as long as first submarginal cell and emitting the radius at the middle; marginal cell about as long as stigma, somewhat obliquely truncate at apex and with the poststigmatal part a little shorter than the substigmatal part; second submarginal cell narrowed about one-half to marginal, receiving the first recurrent vein a short distance from base and the second recurrent at apex; second recurrent and subdiscoidal veins obsolete. Claws deeply cleft, the inner tooth slightly shorter than the outer.

Face below antennae smooth and with a few fine punctures; frons delicately tessellate, shining and rather sparsely and finely punctured; vertex strongly tessellate and rather dull; cheeks shining, yet rather more distinctly tessellate than the frons and sparsely and obscurely punctured. Thorax almost uniformly, finely and moderately strongly tessellate and moderately shining; mesoscutum with very sparse fine punctures, the scutellum almost impunctate, and the pleura sparsely and obscurely punctured. Abdomen with the usual microscopic tessellation. Pubescence moderately long, considerably shorter on disk of mesonotum than elsewhere, erect, whitish, rather uniformly distributed on face, cheeks, vertex, mesonotum and pleura, and moderately abundant and conspicuous.

Head and thorax very dark greenish blue, the thorax entirely dark. Mandibles, except red apices, labrum and clypeus testaceous yellow (perhaps creamy white in life), the clypeus with two large piceous spots on disk above or entirely pale. Lateral face marks absent or in the form of a small creamy white spot on inner anterior corner of lateral plates and adjacent to margin of clypeus. Abdomen very dark brown or piceous, the venter a little paler and shaded with testaceous yellow, especially toward the apex; apical margin of tergites narrowly hyaline but not conspicuously pale; seventh tergite reddish brown. Legs dark brown or piceous, the front tibiae anteriorly and all the tarsi testaceous yellow. Labio-maxillary structure piceous. Scape and pedicel piceous, the flagellum very dark brown above and ferruginous brown beneath. Tegulae testaceous hyaline. Wings

almost clear hyaline, the veins brown with subcosta and margins of stigma fuscous, the stigma otherwise pallid.

Length about 4.5-5.0 mm.

FEMALE

Head slightly wider than thorax, almost as long as wide (but excluding projecting clypeus distinctly wider than long), moderately rounded on sides and less rounded above. Cheeks narrow. Clypeus convex and rather strongly projecting in front of ocular line; disk considerably wider than long and rather well rounded above; lateral extensions of clypeus rather short and broad and so strongly inflexed that they are almost entirely concealed in frontal view of head. Dog-ear plates rather large and very pointed below. Lateral plates of face strongly widened below and at middle of dog-ear plates each covering somewhat less than one-fourth the total width of face. Prominence between antennae rather high and tectiform, the ridge reaching onto both the supraclypeal area and frons. Median impressed line of frons reaching from anterior ocellus to a point opposite the middle of antennal sockets. Mandibles moderately stout, rather strongly curved on apical half, somewhat laminately expanded on inner margin, simple and acute at apex and reaching when closed to far margin of labrum. Abdomen oval, about twice as long as wide, the tergum moderately convex; apex of pygidium rather narrowly truncate. Wings as in the male, except that the third discoidal cell is distinct; apical part of radius if continued in a straight line would intercept cubitus at apical third of first submarginal cell (but in *P. halictoides* it would intercept cubitus at apex of first submarginal cell). Claws simple.

Frons, vertex and thorax nearly uniformly and distinctly although finely tessellate and moderately dull, the tessellation continued on sides of face below antennae, but supraclypeal area, clypeus and lower end of lateral plates polished and shining. Cheeks rather more delicately tessellate than other parts. Punctures very sparse and shallow on clypeus and supraclypeal area, and numerous but well separated, fine and nearly uniform in distribution over entire frons and sides of face. Punctures of mesonotum also uniformly distributed but not quite so close as on frons; those of cheeks and pleura about as close as on frons but finer and more obscure. Abdomen moderately shining, microscopically lineolate and with extremely fine setiferous punctures on tergites 3 to 5. Pubescence whitish, moderately long and dense. Tergites 3 and 4 with sparse, very fine, short, appressed hair besides the usual longer hair on 5. Scopa of hind tibiae moderately long and dense, and with the longer straight hairs on outer surface somewhat plumose.

Head and thorax very dark, slightly bluish green. Supraclypeal area, more or less of clypeus and lower end of lateral plates of face shining piceous, with the more or less developed face marks, confined to clypeus and lateral marks, creamy white. Clypeus varying from almost all dark, with a small nubilous central pale streak, to almost entirely pale, and in intermediate condition having the anterior border and two submedian vittae piceous. Lateral face marks small, subquadrate, placed close to sides of clypeus and well separated from eye margins, or frequently absent. Mandibles and labrum usually piceous, the former with apices reddish; or, when

face marks are well developed, the labrum may be brown and the mandibles, except reddish apices, creamy white. Head otherwise and the thorax entirely dark, or the hind margin of pronotum sometimes with a thin white spot on each side. Abdomen piceous, without markings, the pygidium brown, and the subhyaline apical margin of tergites obscurely pale. Legs piceous or brownish piceous, the tarsi often browner and the front knees sometimes with an obscure yellowish spot. Labio-maxillary structure piceous, varying to brown in paler specimens. Antennae piceous with the flagellum somewhat brown above toward apex and reddish brown beneath. Tegulae testaceous with basal margin piceous. Wings hyaline, appearing somewhat milky in some aspects, the veins fuscous, with subcosta and margins of stigma a little darker, the stigma otherwise pallid.

Length about 4.5-5.5 mm.

Described from 2 females, 1 male (holotype male, allotype and paratype) collected Aug. 28, 1923, at flowers of *Chrysopsis mariana* (Linn.), Bryson City, North Carolina (Crawford); 1 female (paratype) at the same flower, Sept. 24, 1916, Hyattsville, Maryland (Viereck); and 5 females, 1 male (paratypes) collected Sept. 1902, at Griffin, Georgia (Bridwell). The types in collection of the author, and paratypes in the Bridwell collection.

14. **Perdita georgica** n. sp.

This species belongs to the *ignota* group and is closely related to *P. chrysopsina* Timb., but is quite distinct in many ways. The male with the abdomen dark runs in Cockerell's table to *P. trisignata* Ckll. (couplet 53), from which it differs by having the frons and vertex somewhat shiny and minutely punctured, the lateral face marks broader than high but sometimes with a more or less narrow and acute extension along the orbits to level of antennal sockets, etc. The male with the abdomen dark reddish brown might run (although the color is rather too dark) to *P. chamaesarachae* Ckll. (couplet 11). *Georgica* is closely allied to *P. mellina* Ckll. and *P. cambarella* Ckll., which also run to *chamaesarachae* in Cockerell's table, but the female is conspicuously different from the same sex of those species.

The female runs to *P. verbesinae*, var. *nigrior* Ckll., (couplet 23), from which it differs by its smaller size, by having the veins dark brown and the head and thorax very dark green instead of brassy green. Females having three large, more or less confluent yellowish marks on anterior part of clypeus, run to couplet 53 containing *P. californica* (Cress.) and *P. trisignata* Ckll.

MALE

Head varying from ordinary in size to rather large, about as long as wide and strongly quadrate. Cheeks very broad but simple. Disk of clypeus somewhat broader than high and well rounded above; lateral extensions of clypeus very strongly inflexed at each side of labrum but less inflexed toward base of mandibles and only partially visible in frontal view of head. Lateral plates of face very strongly widened below and each at level of dog-ear plates covering about one-fourth the total width of face or covering almost one-third in large-headed specimens. Prominence between antennae low and convex; the frons with an extremely fine impressed median line reaching from the prominence to the anterior ocellus but nearly obsolete at the middle. Mandibles long, simple, very acute at apex, reaching considerably beyond far margin of labrum, gradually broadened at base and very slightly expaned on inner margin near middle. Antennae ordinary, the middle joints of flagellum as long as thick. Pleura of prothorax very deeply and broadly sulcate as in species of the *albipennis* group, and with the bottom of the sulcus acutely angled and not rounded as in *P. albipennis* Cress. Abdomen broadly ovate, convex, about one-half, or a little more, longer than wide, the apex hardly recurved; apex of seventh tergite moderately wide and rounded. Membrane of wings with very fine short setae which are denser in apical field; stigma moderately wide, almost as long as first submarginal cell and emitting radius at the middle; marginal cell nearly as long as stigma, somewhat obliquely truncate at apex and with the substigmatal part a little longer than the poststigmatal part; second submarginal cell narrowed about two-thirds, or even more, above, and receiving the first recurrent vein a short distance or rather remotely from base and the second recurrent at apex; sub-discoidal and second recurrent veins obsolete, or the second recurrent sometimes distinct but finer than the other veins. Claws cleft not quite to the middle and with the inner tooth a little shorter than the outer tooth.

Face and frons shining and with very fine sparse punctures which become more numerous but still widely separated on the frons of the large headed specimens; frons and lateral plates of face delicately tessellate. Vertex considerably more strongly tessellate than frons, moderately dull and with sparse fine punctures. Cheeks shining, delicately tessellate and with extremely fine sparse punctures. Thorax moderately shiny, distinctly but not very strongly tessellate all over, the tessellation a little coarser on base of propodeum, mesonotum and pleura finely and very sparsely punctured; disk of pronotum opaque and densely but microscopically punctured. Abdomen with the usual microscopic tessellation. Pubescence sparse, especially for a species of the *ignota* group, erect and whitish; longest on the vertex, pleura and legs; very short and thin on the cheeks especially in the large-headed specimens, and moderately long on face, frons and mesonotum; in specimen with largest head the pubescence is almost lacking on the frons, but it is perhaps denuded. Disk of pronotum with dense but extremely short fine hair.

Head and thorax very dark green, the propodeum and pleura very slightly bluish, the thorax entirely dark. Mandibles, except reddish apices, labrum, clypeus except broad posterior margin of disk, and large lateral face marks yellowish white. Lateral face marks either transverse and

not wider at outer ends where they reach to the orbital margin, or triangular, a little broader than high and reaching along orbits to level of antennal sockets, or sometimes the marks are abruptly and rather narrowly extended along the orbital margin. Cheeks entirely dark or with a yellowish white spot next to the orbits and base of mandibles, sometimes covering one-fourth the length of the posterior orbits. Abdomen either uniformly dark or reddish brown, the narrow hyaline margin of tergites not conspicuous, the last tergite and venter pale brown to testaceous yellow. Legs brown to piceous, the front and middle tibiae and all the tarsi testaceous yellow. Antennae brown, the flagellum ferruginous brown above and yellowish beneath, the scape dull yellow beneath. Labio-maxillary structure brown. Tegulae testaceous hyaline. Wings hyaline and slightly milky, the veins and stigma brownish yellow, with subcosta and margins of stigma darker.

Length 4.0-5.0 mm.

FEMALE

Similar to the male. Head a little wider than long, rather well rounded on sides and above. Cheeks ordinary. Clypeus prominent, convex, strongly projecting in front of ocular line, the disk about as high as wide, well rounded above, the lateral extensions broad at inner ends where they are strongly inflexed. Lateral plates of face strongly widened below and at level of dog-ear plates each covering about one-fourth the total width of face. Prominence between antennae low, subtectiform, with a fine impressed median line which reaches to the middle of frons and from there continued to anterior ocellus as a fine smooth line. Mandibles stouter than in male, rather long and reaching to far margin of labrum, acute at apex and with a narrow laminate expansion on inner margin, which is abruptly contracted to form a blunt inner tooth near apex. Propleura not deeply sulcate as in male but normal. Abdomen oval, about twice as long as wide, the pygidium broad and with a broadly rounded apex. Wings as in male, except that the third discoidal cell is complete. Claws simple.

Face including clypeus delicately tessellate and shining, with the pale part of lateral plates polished. Frons and vertex strongly tessellate and rather dull, the cheeks more shiny than the frons and less strongly tessellate. Frons, lateral plates of face and supraclypeal area with numerous very fine and well separated punctures, the clypeus with sparser, coarser punctures. Vertex and cheeks indistinctly punctured. Thorax nearly uniformly and strongly tessellate and rather dull, with abundant but well separated fine setiferous punctures, and the mesopleura with similar but indistinct punctures. Pubescence much denser than in male and quite normal for the *ignota* group, whitish on head and pleura and pale brownish or ochreous on mesonotum and legs. On mesonotum it is short, erect, rather coarse, abundant and conspicuous; on face and frons it is short and erect; on cheeks, vertex and pleura it is longer and erect. Tergites 3 and 4 with short, subappressed hairs scattered all over the disk, and tergite 5 with much longer, coarser, erect white hairs. Scopa rather dense and long, with the hairs briefly plumose.

Head and thorax very dark green or blue-green. Clypeus black or dark brown, the labrum piceous or reddish brown. Mandibles, except dark red apices, testaceous yellow. Lateral face marks and sometimes marks on

disk of clypeus creamy white. Lateral face marks transverse, rounded at inner end and with a more or less narrow and abrupt extension along the orbits to lower end of foveae above level of antennal sockets, so that the total height is greater than width although the main part is transverse. Clypeus usually entirely dark, but sometimes with a longitudinal oval spot on center of disk, or sometimes with two additional spots on each side anteriorly; these marks sometimes coalesced or separated by a pale brownish shade. Tubercles, a transverse spot on each side of hind margin of pronotum and a similar spot at middle of anterior margin of pronotum creamy white. Abdomen piceous, without markings, but the pygidium ferruginous and the venter more or less brownish. Legs piceous or dark brown, the tarsi paler; no distinct pale markings on legs, but the anterior margin of front tibiae is sometimes shaded with yellowish, especially toward the base. Labio-maxillary structure piceous or dark brown. Antennae piceous, the flagellum paler toward apex, the apical joint above and whole flagellum beneath, except first one or two joints, dull brownish yellow. Tegulae testaceous hyaline. Wings hyaline, rather faintly tinted with fuscous; veins brown, the subcosta and margins of stigma darker and center of stigma pallid.

Length about 5.0-5.5 mm.

Described from 7 females, 3 males (holotype male, allotype and paratypes) collected in September, 1902, at Griffin, Georgia (Bridwell); and 2 females (paratypes) collected Oct. 17-19, 1914, at De Funiak Springs, Florida (F. E. Watson and A. J. Mutchler). The types in the Bridwell collection at Honolulu, three paratypes in collection of the Citrus Experiment Station, Riverside, California, and the two Florida paratypes in collection of the American Museum.

The Sphecid Wasp, Podalonia* violaceipennis (Lep.)

BY F. X. WILLIAMS

(Presented at the meeting of April 7, 1927)

Podalonia violaceipennis is a common, slender red and black Sphecid wasp that stores caterpillars in short burrows. It is widespread in California, occurring from the Pacific to high up in the Sierra Nevada mountains. In July, 1925, this insect was observed in the Sierras nesting at the base of a huge pine tree at an altitude of 6,500 feet. It captures and paralyzes by stinging, rather short-haired, inch-long processionary caterpillars (*Malacosoma* sp.) that make web nests on *Ceanothus* bushes. Each caterpillar is placed in a short steep burrow, a slender egg affixed to the side of the abdomen, and the burrow stoppered up with soil. One wasp may make quite a number of nest-holes close together, and in a small area at the base of a pine tree, 11 parasitized processionary caterpillars were disinterred. On July 30, 1925, I secured 4 freshly spun cocoons in this locality, said cocoons being dark brown with a nipple like extension from the base. These cocoons were kept in the warm laboratory in Honolulu. None hatching that summer, one was cut open on October 12, 1926, when it was found still alive as a quiescent, rather shrunken larva. Ultimately it perished of exposure. On December 22, 1926, the remaining cocoons were placed in a small refrigerator where though the temperature varied, it averaged perhaps 55° F. On January 31, 1927, the cocoons were taken out and placed in the warm laboratory. On February 25, of the same year, I heard a squeaky buzz that announced the hatching of a male *Podalonia,* the insect cutting, nearly through, a circular lid at the top of the cocoon.

Thus the cocoon stage of this wasp under the Hawaiian conditions unusual to it, was within a few days of 19 months, and it appeared necessary to bring about some substitute for the California winter to enable *Podalonia* to complete its transformations.

* Formerly referred to as *Psammophila.*

The Kamehameha Butterfly, Vanessa Tammeamea **Esch.**

BY FRANCIS X. WILLIAMS

(Presented at the meeting of April 7, 1927)

In the Hawaiian Islands we have but two native butterflies, the large sturdy, red and black *Vanessa tammeamea* and the little bluish, or blue and black *Lycaena blackburni* (Tuely), with the underside of the wings green. Of the eight remaining species of butterflies that occur here, two have been imported from Mexico to help destroy the land-grabbing Lantana bush, one arrived by accident from somewhere farther east and made itself very unwelcome by destroying the seeds of the Pigeon-Pea (*Cajanus cajan*) and the Sunn Hemp (*Crotalaria juncea*), two valuable cover crops; another pest is the familiar "Cabbage White" that disfigures the leaves of cabbages and nasturtiums; a fifth species is the large tawny red and black "Monarch" or "Milkweed" butterfly frequently seen in our towns and city, while the three remaining

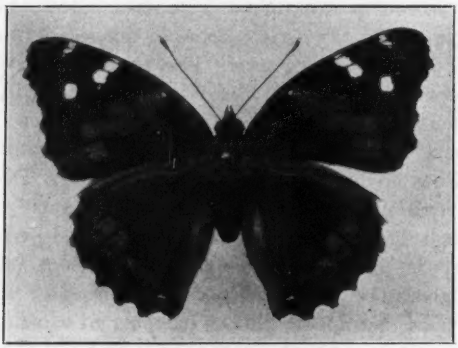


Fig. 1. Kamehameha butterfly, about natural size.

kinds are relatives of the Kamehameha butterfly and insects of wide distribution.

Both of the native butterflies are normally mountain or forest dwellers and for that reason are quite unfamiliar to a large proportion of our population. The delicate little *L. blackburni* might well pass unnoticed, but the Kamehameha butterfly is a conspicuous

though swift-flying insect that may span three inches or more across outstretched wings. In pattern and color it bears considerable resemblance to the Red Admiral (*Vanessa atalanta* Linn.), a butterfly familiar both in Europe and America and occurring also on the island of Hawaii; a more nearly related insect perhaps, is

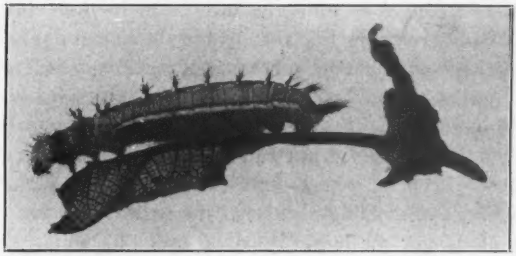


Fig. 2. Kamehameha butterfly larva, natural size.

the New Zealand *Vanessa gonerilla* (Fab.), but its closest relative and one well nigh indistinguishable from it is *Vanessa callirhoë* Fab. from the distant shores of Madeira.

Fig. 3. Kamehameha butterfly pupa, natural size.

During the latter half of the year 1926, I had occasion to frequently visit the haunts of the Kamehameha butterfly and to rear it in considerable numbers from caterpillars secured in the last stage of growth. The several food plants of the caterpillar belong to

the family Urticaceae, of which the fibre plant "Mamaki" (*Pipturus albidus*) is the most favored, with *Urera, Touchardia* (=olona) and *Neraudia* also serving as food; these shrubs grow where there is good soil and sufficient shade and moisture and thus occur chiefly in the canyons. The butterfly itself, however, may occasionally be found at some distance from its food plants and rather infrequently strays into the city; in the mountains it is often semi-gregarious on the edge of a wood or in a small clearing, having a particular fondness for resting on the trunk and limbs of rugged old Koa trees. Very often it is the moisture or sap that attracts them there; at any rate it is no easy matter to discern one of these insects as it rests with the dull-colored underside of its closed wings resembling somewhat the bark of the tree. When conscious of danger the butterfly partly opens its wings, thus displaying its truly gorgeous livery and shuts them again, often in a trembling manner; it is a rather difficult insect to net and when captured its vigorous struggles often render it quite unfit for a cabinet specimen. The females may be distinguished from the male by the presence towards the apex of the forewings of several white spots; in addition she is a generally larger insect with the forewings somewhat wider towards their tips. The Kamehameha butterfly is common in the mountains behind Honolulu and is widely distributed in the archipelago where conditions are to its liking. Most of my observations on it were made on Tantalus (Puu Lehua), and as the main object was the rearing of adult butterflies, little attention was paid to egg laying or to young larvae. Of course the habits and the early stages have been observed heretofore, by Blackburn, Perkins, Swezey and others and so some of these notes may be more or less of a repetition of what has been recorded in earlier days. Several times female butterflies were noticed hovering about *Pipturus* plants and one apparently laid eggs on the stem near the base of one of these bushes; the young larva makes a shelter for itself by cutting in from the margin of a leaf and turning the resulting flap and fastening it down upon the leaf by means of silk; as it moults and increases in size the old retreats are abandoned for one of greater size, although in the last instar when the caterpillar has nearly attained its full growth no true shelter is formed, and it is then to be found freely upon the shoots and leaves. By far the larger number of these cater-

pillars are now mainly a bright green, and provided with inoffensive spines, a very few, however, may be a deep wine brown or sort of purplish with a contrasting line on the side of yellowish. What few chrysalids were seen in the field were suspended by the tail from the twigs of *Pipturus*. In order to pupate, the caterpillar becomes shorter and stouter, spins a mat of silk, which it soon grasps firmly in its anal prolegs, letting go its hold elsewhere swings down suspended tail first; this procedure, of course, is a matter of some hours, many more of which are necessary before it sheds its skin to turn into a pupa; it will be seen that the skin wrinkles somewhat as if becoming freed of the body of the caterpillar which straightens out as the next stage approaches, finally undulating movements—from tail to head—become apparent, a rent behind the back of the head appears in the caterpillar's skin and the pupa can almost be said to crawl out of it, the skin drawing farther and farther tailwards, though still firmly clinging to the silken sheet; at the last the skin is shriveled and free of the newly formed, high shouldered pupa, except towards the tail end of the venter, where it is firmly gripped, seemingly between two segments; the pupal tail armed with the cremaster, a stout peg-like process bearing fine hooks pulls out of the skin and during the vigorous turnings that now take place, hooks itself firmly into the mat of silk; the shrunken and inconspicuous skin usually dropping off in the scuffle. The soft pupa hardens and assumes a better proportioned form; it is not a conspicuous object and if suspended near or among dry *Pipturus* leaves of pale grey and black shades, may indeed be difficult to locate. In perhaps ten days or so, the color and pattern of the butterfly's wings are visible through the wing cases, the abdomen telescopes out a little, and eventually the seams behind the head, at middle of the back of the thorax and before the wings give way before the struggles of the butterfly which pulls itself out, turns about and grasping the now empty shell suspends itself from it so that its stubby little wings may expand and stiffen. It is a matter of several hours before the butterfly is strong enough to take wing and be off.

Not very much success, however, attended my efforts to rear these butterflies. Hundreds of caterpillars were secured in about half a year's time and given plenty of fresh leaves and space; but they proved delicate and temperamental and if they did undergo their

metamorphosis successfully, more often than not undersized adults were the result. Sensitive and irascible too, it would appear, directly that the twig upon which such a caterpillar rests is disturbed it rears the fore part of the body to attention, and upon further molestation swings it vigorously from side to side, emitting at the same time a dark fluid at the mouth, thereby smearing considerably itself or any offending object; this effusion I am sure is detrimental to the larva as it thus loses considerable alimentary fluid in its exertions. This aggressive defence or most of it is soon lost in captivity, though it by no means indicates that the caterpillars are content in their prison, for they are often very restless therein. Only when the caterpillar is making ready to pupate may it again become very agitated though now ejecting no more fluid.

A great number of last stage larvae contracted a disease quite comparable to the wilt of the Gypsy moth caterpillar in the eastern United States; from a healthy green they would turn to a pale sickly yellowish green, lose their vitality, their appetite and regular intestinal functions, and finally turning almost suddenly to blackish, at the same time the tissues breaking down, would practically deliquesce so that the greater part of the unfortunate insect spattered upon a leaf below. This was by no means just a laboratory condition—but many similarly diseased and dead caterpillars were found at large in their forest home, where also the larvae of the moths of *Scotorythra* and *Plusia* were often similarly affected. Towards the middle of 1926, at the Parker Ranch on Hawaii, Mr. O. H. Swezey found what was perhaps the same disease working among the armyworms (*Cirphis unipuncta*), where it assumed epidemic proportions.

Realizing the difficulty of rearing butterflies in the comparatively warmer drier laboratory, many caterpillars were on different occasions netted in their own environment over a terminal branchlet of their food plant and while a number of pupae were thus obtained, the disease still persisted, affecting the pupae as well and showing thereon at first as a darkening of the body at the base of the abdomen. Furthermore, the bobinet prison was not proof against the caterpillar's jaws, or perhaps the teeth of wood rats too were responsible for the holes in the cloth and the missing larvae. No accurate percentage of loss by disease was kept in my

rearing save that out of a lot of 39 large caterpillars but nine adults were secured.

The Kamehameha butterfly seems remarkably free of parasites in the larval stages; and I reared only the large *Chalcis obscurata* Walk., on two occasions from pupae found in the forest. But one wasp issued from each pupa which seemed capable of furnishing sufficient nourishment for several more such wasps. However, Dr. and Mrs. H. L. Lyon of Honolulu collected a number of Kamehameha pupae on the island of Maui of the Hawaiian group and found them heavily parasitized by *Ecthromorpha fuscator* (Fab.), a large black Ichneumonid wasp of common occurrence and that destroys a variety of Lepidoptera in their pupal stage. Perkins (Fauna Hawaiiensis, Introduction, p. CLV-CLVI) has bred *Ecthrompha fuscator* (*E. maculipennis*) and more rarely *Chalcis obscurata* from the pupa of this butterfly.

Phthorimaea Lycopersicella, new species (Family Gelechiidae) a Leaf Feeder on Tomato. (Lep.)

BY AUGUST BUSCK

U. S. Bureau of Entomology, Washington, D. C.

The species here described has been mistaken for, and has been identified in the economic literature* as the very similar species, *Phthorimaea glochinella* (Zeller), which occasionally is injurious to eggplant in the eastern part of the United States. The writer must plead guilty to the major part of this confusion, which was reasonably excusable as long as coloration was mainly relied upon in the differentiation of these obscurely marked species.

The mistake was the more natural because the allied well-known cosmopolitan species *P. operculella* (Zeller) feeds on both tomato and eggplant, as well as on potato and tobacco, and on its original foodplant *Solanum carolinense*.

But with the study of their genitalia it became apparent that we had to deal with two distinct species, of which the one, *P. glochinella*, at present at least is confined to the eastern and southern parts of the United States, east of the Rocky Mountains, while the species here described, *P. lycopersicella*, occurs in California, extending into Sinaloa, Mexico, and has in very recent years been introduced accidentally into the Hawaiian Islands, where it already appears to be well established.

I am under obligation to my friend, O. H. Swezey, for abundant, carefully reared material of this species which has enabled proper identification. I suggested to Mr. Swezey, who has added so much to our knowledge of the Hawaiian fauna, that he describe the species himself, but he has insisted that I must do so, and inasmuch as it affords me opportunity to correct my own mistake, I am glad to do it, the more so because Mr. Swezey will add his notes on the biology of the species.

Phthorimaea lycopersicella n. sp.

Alar expanse: 9-12 mm. Labial palpi with short furrowed brush on underside of second joint, terminal joint somewhat thickened with scales,

* T. H. Jones, Journ. Agr. Res., vol. 26, p. 567, 1922; E. O. Essig, Insects Western North America, p. 717, 1926.

compressed with extreme tip pointed, slightly projecting above the scaled part; ochreous white, externally mottled with dark fuscous; terminal joint with a faint ill-defined fuscous annulation before the tip and with extreme apex fuscous. Face and tongue ochreous white. Head and thorax mottled with fuscous. Antennae yellowish fuscous with narrow, dark fuscous annulations. Forewings elongate ovate, apex bluntly pointed, termen oblique; venation typical of the genus, 12 veins, 2-6 separate, equidistant, 7 and 8 stalked to costa; ground color ochreous gray, heavily overlaid and mottled with dark fuscous scaling, and with ill-defined and indistinct, broken, longitudinal, ochreous streaks; discal stigmata hardly indicated; plical spot on middle of fold faint and ill-defined, blackish; cilia ochreous gray. Hindwings with apex pointed, produced; termen deeply sinuated; 8 veins, 3 and 4 connate, 5 approximate, 6 and 7 parallel; light ochreous fuscous; a strong pencil of hair-scales, dilated at tip, from base of costa in the males, reaching to beyond middle of wing, yellowish. Abdomen dark fuscous above with two basal joints slightly lighter, ochreous, underside light ochreous, sprinkled with fuscous. Inner side of legs light ochreous, outer side heavily barred with dark fuscous.

This species is hardly distinguishable in color from *P. glochinella*, which, however, averages slightly larger and darker, and which sometimes has the discal stigmata faintly indicated; the male hair-pencil in this species is, though well-developed, much smaller than in *lycopersicella*, and the hairs are not dilated at tip. The genitalia, on the other hand, give clear-cut characters of differentiation in both sexes as shown in figs. 2, 3, 5 and 7. The plates of the eighth abdominal segment, which cover the male genitalia when at rest, are nearly alike in the two species. The uncus is long and hookshaped in both species (very different from the short hoodlike uncus of the type of the genus, *P. operculella*, the genitalia of which are given for comparison [Figs. 1 and 4], but it is much longer and more curved in *glochinella* than in *lycopersicella*. The gnathos is weak, pending in thin arms from pointed projections of the tegumen. The vinculum has a very long and slender anterior process; in *glochinella* this process is rather short and stout. The anellus is a broad plate with a central and two lateral processes supporting the aedoeagus. The aedoeagus is very long and slender with strongly chitinized, thorned apex and terminates basally in a globular bulb into which the penis tube enters through a lateral circular hole. The harpes are long, slender, sinuate, enlarged and forked at the tip. This last character furnishes the easiest offhand distinction between the two species, as it may be ascertained under the binoculars or even with a good hand lens without making a slide of the genitalia, merely by moistening the parts in situ.

P. operculella (Zeller), the type of the genus, is easily differentiated in male genitalia (fig. 1) by the hoodlike uncus and the large tonguelike gnathos with the bulbous base, as well as by the extravagantly developed eighth abdominal joint.

The female genitalia have the flattened lobes of the ovipositor bent towards and facing each other so as to form a partial tube; the genital plate is small, transverse, deeply sinuated posteriorly on both sides of the genital opening; it is laterally fused with the chitinous parts of the penultimate joint and with its supporting internal rods, which appear part of the plate, as is normal in the family Gelechiidae; it is continued into a strongly

chitinized upper part of the genital tube, which shortly beyond this part terminates in the large, oblong oval bursa copulatrix, in the upper third of which is a thornlike, strongly curved signum. *P. glochinella* has a larger, more rectangular and less sinuated genital plate, and the signum is very robust, nearly twice as large but less curved than that of *lycopersicella*. *P. operculella* (fig. 4) is at once distinguished by the scobinated anal half of the genital plate, which terminates in two small posterior teatlike papillae; though the larger species, its signum is smaller than in the two smaller species.

Described from ten specimens of both sexes reared from larvae feeding on tomato, Oahu, Hawaiian Islands, February, March, and August. (O. H. Swezey.)

Type—U. S. Nat. Museum Cat. No. 40856.

Cotypes—In collection of the Hawaiian Entomological Society, Honolulu, Hawaii.

Paratypes and other exponents of this species, also reared from tomato, from California and Sinaloa, Mexico, in U. S. National Museum.

P. glochinella and *P. lycopersicella* are clearly congeneric, but the writer is doubtful about the propriety of retaining them in the genus of which *Phthorimaea operculella* (Zeller) is the type. The long hook-like uncus of these two and other allied species is an uncommon character in the family Gelechiidae and harmonizes very poorly with the short hood-like uncus of *P. operculella,* which in this and other respects is more like the allied genus Gnorimoschema Busck. In fact the writer is not yet satisfied about the limitations of these two genera.* The characters used

* My friend, Mr. Edward Meyrick, the author of the genus Phthorimaea, appears to be similarly undecided from his shifting several of his South American species from one genus to the other, and Mr. Alfred Philpott of the Cawthron Institute, New Zealand, has pointed out (Trans. N. Z. Institute, vol. 58, p. 349, 1927.) that *operculella* departs considerably, in genitalia, from other New Zealand species included in the genus. I have not had opportunity to examine these New Zealand species, but I find that most of the European species referred to the genus, though also differing in details from the type, may still be properly included (*streliciella* H. Sch.; *psilella* H. Sch.; *artimisiella* Tr.; *obsoletella* F. & R. and others). The Indian tobacco pest, *P. heliopa* Lower, is also correctly included with *P. operculella; operculella* differs, however, from all of these allies by the absence of a chitinized hooked termination to the tonguelike gnathos and the much longer slender aedoeagus, as well as in the possession of a strong hair-pencil at the base of the hindwings of the male, which secondary sexual character was at one time, alone, considered sufficient to establish the genus as distinct from Gnorimoschema.

hitherto—the clothing of the labial palpi, the more or less true parallelism of veins 6 and 7 in the hindwings, and the basal costal hair-pencil on the hindwings of the male—in which characters the two present species partake—do not suffice to arrange the species referred to the two genera according to their natural affinities. Much additional study is required to define these two (or more) genera properly, but in the meantime the two species dealt with in this paper, and their American allies, may be temporarily retained in Phthorimaea, which they resemble so much in color and general habitus, as well as in the characters hitherto considered sufficient for generic differentiation.

The drawings of the genitalia were made under the writer's direction by Miss Eleanor T. Armstrong of the U. S. Bureau of Entomology, and I am under obligation to her for her careful and intelligent execution of them.

The curiously similar namesake, *lycopersicella* Walsingham (Proc. Zool. Soc. London, p. 71, 1897), which feeds similarly on tomato in St. Croix, West Indies, and which also has a hair-pencil at base of the hindwing of the male, belongs to the genus Aristotelia as proven by the types in British Museum and in collection Gudmann, Copenhagen.

Explanation of Plates

MALE GENITALIA

Figure 1. *Phthorimaea operculella* Zeller.
Figure 2. *Phthorimaea glochinella* Zeller.
Figure 3. *Phthorimaea lycopersicella* Busck.

FEMALE GENITALIA

Figure 4. *Phthorimaea operculella* Zeller.
Figure 5. *Phthorimaea glochinella* Zeller.
Figure 7. *Phthorimaea lycopersicella* Busck.
Figure 6. *Phthorimaea lycopersicella*—Wings of male.

Terms Used in the Figures

MALE GENITALIA

Vm—vinculum
An—anellus
Ae—aedoeagus
Hp—harpes
U—uncus
Gn—gnathos
Tg—tegumen

FEMALE GENITALIA

Op—ovipositor
Pl—genital plate
Go—genital opening
Db—ductus bursae
Bc—bursa copulatrix
Sm—signum

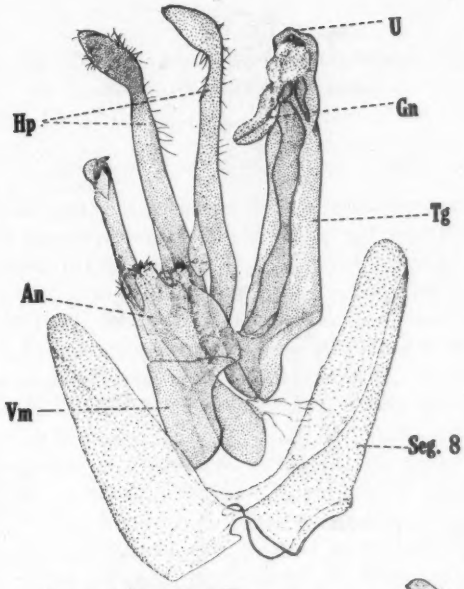


Fig. 1 operculella Zeller

Fig. 2 glochinella Zeller

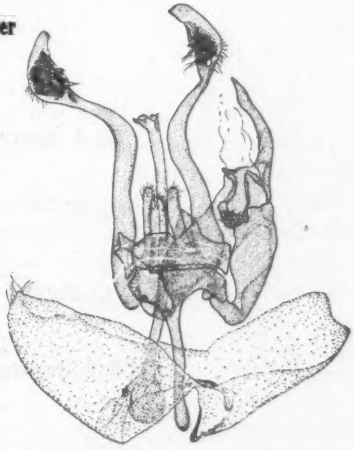


Fig. 3 lycopersicella Busck

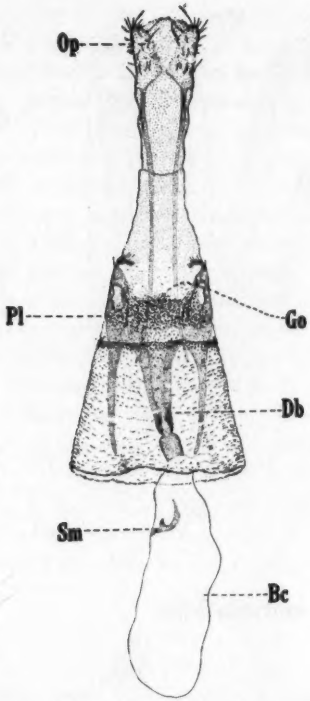


Fig. 4 operculella Zeller

Fig. 5 glochinella Zeller

Fig. 6 lycopersicella Busck

Fig. 7 lycopersicella Busck

Notes on the Tomato Leafminer, *Phthorimaea Lycopersicella* Busck, in Hawaii. (Lep.)

BY O. H. SWEZEY

(Presented at the meeting of July 7, 1927)

On several occasions small moths have been reared from larvae feeding on tomato leaves in a somewhat different manner from what the larva of *Phthorimaea operculella* (Z.) usually does. The moths that issued were smaller than this species, but for the time were considered to be only undersized specimens of *P. operculella* (Z.). Finally specimens were sent to Mr. August Busck of the U. S. Bureau of Entomology for determination. In a letter from him dated April 13, 1927, he stated that it was the same as the species known in recent literature as *P. glochinella* (Z.), the eggplant leafminer, which has been considered an important pest of late years on tomato and eggplant, especially in California, and Mexico. It is also known in Virginia, Kentucky, Missouri, Louisiana, Texas and Colorado. Later study of the species led to the discovery that it was different from *P. glochinella,* a new species as described by Mr. Busck in the preceding pages under the name *Phthorimaea lycopersicella.*

The first rearing of this moth to come to our attention in Hawaii was from tomato leaves sent from Molokai in August, 1925. The next was from tomato leaves collected February 7, 1926, at Makapuu lighthouse, Oahu. The same month (February 24) it was reared from larvae on tomato leaves collected at Waialua, Oahu. The latest rearing was from Waimanalo, Oahu, March 13, 1927. In the three latter instances the larvae were on leaves of the small-fruited tomato growing wild in waste places. Those from Molokai were from the cultivated tomato.*

The larva of this moth behaves somewhat differently from other related leafminers. It folds over the edge of the leaf, or fastens together the surfaces of a fold or wrinkle, or makes use of a lobe of a new leaf that has not entirely unfolded yet, for a hiding place,

* This species was later reared from larvae on tomato leaves collected March 21,1928, in a garden at Waimea, Kauai. Thus it is now known on Oahu, Kauai and Molokai. (Editor.)

and feeds on the inner protected surface of the leaf. It does to some extent feed as a miner, the mine extending out from the retreat or hiding place, and it does not remain in the mine when not feeding. Several retreats may be made use of during the life of the larva. Pupation takes place within one of these retreats.

The larvae of the related *P. glochinella* mine the leaves of the eggplant, and are said to feed entirely within the leaf. The larvae of *P. operculella* mine the leaves of several solanaceous plants as: potato, tobacco, tomato, Datura, and they also bore into green tomato fruits and potato tubers. So far, here in Hawaii, larvae of *P. lycopersicella* have not been found attacking any other plant than tomato and they have not been found attacking its fruit. From this latter fact, it is not so important a tomato pest here in Hawaii as *P. operculella,* whose larvae infest the tomato fruits very badly at times.

The full-grown larva is 5-6 mm., of a greenish color, with an interrupted mid-dorsal line of purplish fuscous shade, on each side of it a row of patches of the same color, and a spiracular line of smaller similar colored spots, another line of similar spots below the spiracles; spiracles circular, minute; head very pale greenish, eyes black, and black line on posterolateral margin, the portion behind the eyes much widened; cervical plate concolorous, with a wide black line at the posterior margin. The very young larva lacks the purplish markings, has head entirely black and the cervical shield nearly entirely black.

When larvae have been collected for rearing the moth, about half have been found to have been parasitized by *Angitia blackburni* (Cam.). This parasite oviposits in the caterpillar. The latter is not killed till after it makes its cocoon; then the parasite larva finishes its growth, issues from its host and spins its cylindric-oval light brown cocoon within the host cocoon.

Insect Fauna of Panicum Torridum, a Native Grass in Hawaii

BY O. H. SWEZEY

(Presented at the meeting of April 7, 1927)

This grass is occasionally found growing in patches in the dry regions of Kaimuki, Koko Head and the southeast end of the Koolau Mountains. It is an annual, and in these dry regions comes up only after a rainy spell. Usually it occurs in somewhat shady places, as for example beneath kiawe trees.

On February 22, 1927, while scouting for armyworms and their parasites, I came upon a newly-grown patch of this grass beneath kiawe trees near the summit of Koko Head. Almost at once I noticed that some of the grass heads were dead, and on examination found that this was caused by a borer, a lepidopterous larva which was new to me. Therefore I set to work to secure as many of these borer larvae as possible in order to rear to maturity and determine what it was. In doing this I noted a number of other insects attacking the grass, and I think that it would be worth while listing these and their associates also found present. A second visit was made to the region on March 22. The insects listed include those collected or reared from material obtained at these visits.*

Acrapex exanimis (Meyrick).

The moths which were reared from the stem borers found, turned out to be this species, which was described as *Caradrina exanimis* by Meyrick in Fauna Hawaiiensis, I, p. 153, 1899, from a single specimen collected in Kona, Hawaii, by Dr. Perkins. Nothing had been seen of it since. This single specimen is in the British Museum. Having never seen this species, when moths

* On January 11, 1928, the Koko Head region was again visited and considerable evidence of the borer was found in the new growth of *Panicum torridum*. From material collected half a dozen moths were reared. On February 11, 1928, in *Panicum kaalense* at about 2,500 feet elevation on the base of Mt. Kaala, similar "dead hearts" were found abundant, but no larvae were found in any of them. Possibly these were the work of this same moth, but it remains to be proven by subsequent observations.

issued from my *Panicum torridum* material, they looked so much like *Sesamia* (*Nonagria*) *inferens* (Wlk.) of which I found pictures and descriptions in literature, that I thought that it was it, or a related species. Hence, that here was a new immigrant insect that was likely to become a pest on rice and sugar cane, for *Sesamia inferens* is a pest on rice, sugar cane, corn, and grasses in India. Some scouting was done of rice fields and various grasses, but no evidence was found of the work of any stem borer. Also, some collected larvae were transferred to small cane plants in cages. Some of them ate a little, but none of them grew to maturity.

From larvae and pupae brought in from Koko Head, about a dozen moths were obtained. A few of these were sent to Mr. Edward Meyrick in England, for study and confirmation of identity. However, he recognized it as his species *exanimis,* and this was corroborated by comparison with the type in the British Museum, which had been placed by Hampson in the genus Acrapex, a genus closely related to Caradrina in which it was first placed. This is very close to Sesamia, too, the genus to which I had provisionally referred it. It was a relief to know that it was not a new immigrant pest that we had to deal with. It probably was an immigrant originally, for Hampson synonymizes with it *exsanguis* Lower, which is known in Queensland, but described three years later than *exanimis.*

Two clusters of eggs were found placed behind leafsheaths of the grass. There were 17 and 25 eggs in these clusters respectively. These hatched in about a week. They were used in a cage with sugar cane plants where they lived for a short while but eventually died, so that the life cycle was not determined.

Larvae obtained in the field and about full-grown, were whitish without markings, spiracles black, head uniform yellowish or stramineous, eyes black, thoracic shield concolorous with head, but paler. The larvae apparently migrate from one stem to another, for in many bored stems with "dead hearts" not enough eating had been done to suffice for the growth of a larva.

Pupation takes place in a slight cocoon where the larva finally finished eating. From larvae brought in, it is apparent that there is a period of a week or more after the larva finishes eating before

pupation takes place. About two weeks were occupied in the pupal stage. The pupa is about 11mm. long, rather slender, quite uniformly pale brown; the wing cases extend to the apex of the third abdominal segment; cremaster slightly blackened, blunt, somewhat roughened, without spines or hooks.

Meyrick has redescribed the moth on page 92 of this issue.

Bedellia oplismeniella Swezey.

Quite a good many of the leaves contained mines of this little moth whose larvae so abundantly mine the leaves of the grass *Oplismenus compositus* everywhere in the native forests. Five adults were reared from mined leaves brought in. One parasite, *Secodella metallica* (Ashm.), issued from one of the mines.

Omiodes demaratalis (Walker).

Two larvae of this grass leafroller were found in the usual rolled leaves. The moths were reared.

Plusia chalcites Esp.

An empty pupa was found in a cocoon on a leaf. An egg was also found on underside of a leaf. The leaves showed the eating of Plusia caterpillars to some extent. On one leaf was a cocoon of *Hyposoter exiguae* (Vier.) with the Plusia skin attached. This parasite had fed on the Plusia caterpillar. An adult issued from the cocoon within a few days.

Pyroderces rileyi (Walsm.).

The pink larvae of this scavenger moth were found feeding in the "dead hearts." Several of the moths reared out of material brought in.

Aphis maidis Fitch.

Some of the plants had quite an infestation with this aphis. The following aphis enemies were present:

Coelophora inaequalis (Fab.). A ladybeetle.

Allograpta obliqua (Say). Syrphid fly maggots feeding on the aphids. The adult flies also present.

Micromus vinaceus Gerst. Eggs and larva.

Aphelinus maidis Timb. Five black parasitized aphids were found, from which the parasites issued a few days later.

Chrysopa lanatus Banks. One cocoon found, from which the adult issued ten days later.

Pseudococcus insularis Ehr.

There was considerable infestation by this mealybug, chiefly beneath the leafsheaths. From material brought in the following issued:

Scymnus debilis Lec.

Scymnus ocellatus Sharp. The larvae of these two ladybeetles were feeding on the mealybugs.

Gitonides perspicax Knab. A fly whose larvae were feeding among mealybugs.

Anagyrus swezeyi Timb. Mealybug parasite.

Thysanus dactylopii Timb. Hyperparasite of mealybugs.

Antonina indica Green.

Occurred at the base of the stems and on the roots.

Scolytid beetle.

A few beetles of a very small species were found boring in dead stems.

Thrips.

Two or three species were found in the flowering panicles.

One of these was described by Moulton as *Anaphothrips swezeyi* (page 107 ante).

Acari.

In a few places clusters of gravid female mites were found amongst frass where they had fed on and consumed the larvae of *Acrapex exanimis.*

Conocephalus saltator (Sauss.).

A few clusters of the eggs of this grasshopper were found beneath leafsheaths.

Insect Fauna of the Silversword and Greensword.

BY O. H. SWEZEY AND OTTO DEGENER

(Presented at the meeting of October 6, 1927)

These two plants, *Argyroxiphium sandwicense macrocephalum*, and *A. virescens*, respectively, are very restricted in their distribution on the Island of Maui. It has been known for some time that certain insects are peculiar or attached to them, though no special study has been made of them. Very few of the entomologists have ever been to the places where these plants grow, and since the time of Dr. Perkins' collecting there have been but two or three such occasions. In August, 1927, while camped in Haleakala Crater collecting plants, Mr. Otto Degener collected a number of insects from these plants, the study of these for record is the incentive for the present paper.

LEPIDOPTERA

Phycitid.

In the flower heads the larvae of a Phycitid moth destroy many of the growing seeds. This has been known for some time but the identity of the species has not been ascertained. It is thought to be a new species of a hitherto undescribed genus. No specimens of the moth have been reared in good enough condition for description. The larvae have also been found feeding amongst the leaves at the base of the plants which have not yet reached the blossoming stage. In this way they could carry over by different broods between blossoming seasons.

Euxoa epicremna (Meyr.) (?).

Three large Noctuid caterpillars apparently nearly full-grown were found hiding beneath silversword plants. As there was no other vegetation nearby, it must be inferred that they were living on the leaves of the silversword, the lower leaves of which rest in a mass on the ground. Possibly these caterpillars belong to the dark species *Euxoa epicremna* (Meyr.) collected by Mr. Swezey at the summit of Haleakala on June 17, 1927. A few moths were secured from the surface of the water tank for watering horses at

the Haleakala shelter house. They were very frequently scared up from clumps of bushes along the trail to White Hill and Red Hill, but were too quick of flight for capture. No larvae were to be found under clumps of bushes, or in grass tufts.

Tineid.

Quite a number of small caterpillars, probably from the old dead leaves.

HOMOPTERA

Ilburnia argyroxyphii (Kirk.).

A number of these small leafhoppers which feed on the young plants. This species has been known for some time, and has been collected by Dr. R. C. L. Perkins and O. H. Swezey. Three of a mymarid parasite (*Polynema* sp.) which is probably an egg-parasite of this leafhopper were collected by Mr. Degener.

Ilburnia bridwelli Muir.

Two specimens of this leafhopper were collected on greensword in a gulch mauka from Puu Nianiau, Maui, August 29, 1917, by Bridwell. At the same place on June 15, 1927, Swezey secured a series of 20 specimens from silversword plants.

DIPTERA

Tephritis cratericola Grimshaw.

A trypetid fly that breeds in the flower heads of *A. sandwicense*. Has been known for some time. Was first collected by Dr. Perkins. Also collected by Swezey, July 21, 1906. In connection with the larvae of the Phycitid moth above mentioned, prevents very much seed production. Mr. Degener found this also abundant in heads of *A. virescens*, where a good deal of this plant was growing in the Keanae Gap.

COLEOPTERA

Nesithmysus n. sp.

Ten larvae of various sizes, 2 adults and fragments of another beetle were found in stems of silversword that were flowering. They were not in other plants which were not flowering, and Mr. Degener did not consider that they were concerned or responsible for lack of seed production, as they infested the stems too late in their growth. This is the first finding of this beetle in

this plant. It appears to be the same species of which Swezey obtained 2 specimens from *Raillardia* bushes on the summit of Haleakala, June 17, 1927. Larvae were also found in dead stems of the Raillardia, and a few exit holes where beetles had issued. Both lots of specimens have been sent to Dr. Perkins for study and description.

Proterhinus fuscicolor Perkins.

This small species was discovered on the greensword in a gulch mauka from Puu Nianiau, Maui, on August 29, 1918, by Swezey and Bridwell. At the same place a series of 34 beetles was collected by Swezey, June 15, 1927. No larvae were found, but the beetles were found amongst the numerous dead leaves at the base of stems and it is to be inferred that the larvae fed in these leaves or in the stems of the dead plants.

MISCELLANEOUS

Some incidental captures on the greensword by Swezey, June 15, 1927, were the following, which are not to be considered as attached or particularly belonging to this plant:

1 *Oodemas mauiense?*
2 *Lathridius nodifer?*
2 Green jassids, probably *Nesosteles* sp.
4 *Nysius* sp., probably 2 species.
1 *Ithamar hawaiiensis* Kirk.

Palm Seed Scolytids in Hawaii (Col.)

BY O. H. SWEZEY

(Presented at the meeting of November 4, 1927)

From specimens sent to Dr. E. C. Van Dyke, he has recently determined as *Coccotrypes dactyliperda* (Fabr.)* a brown scolytid that breeds abundantly in date seeds. So long ago as 1916, J. C. Bridwell found this insect feeding in date seeds lying on the ground where they had fallen from the trees. No attempt was made at

* *Bostrychus dactyliperda* Fabr., Syst. El. II, p. 387, 1801.

the time to have it determined, and little interest has been taken in it.

On noticing in the January, 1927, issue of the Pan-Pacific Entomologist a note by Dr. Van Dyke recording the occurrence of this beetle in seeds of *Phoenix canariensis* at Los Angeles, October 1, 1926, I surmised that the scolytid in date seeds in Honolulu might be the same species. Accordingly, I secured some fresh specimens and sent to Dr. Van Dyke, who immediately recognized it as the same that he had examined from Los Angeles.

Dr. Van Dyke says it is a native of Africa and Asia, and that it breeds in the betelnut also. It has become quite widely spread. That it is very abundant in Honolulu is shown by the count of beetles issuing from a few date seeds picked up under a palm tree in Kapiolani Park, September 22, 1927. Many of the dry seeds which were free of pulp, had a hole being bored in by a female beetle, as indicated by the extruded borings. Some seeds which had been longer occupied contained all stages of the beetle: eggs, various sizes of larvae, pupae and adults. From beneath one tree, 38 seeds with a single boring were collecting and retained in a jelly tumbler. Between October 25 and November 3, 3518 beetles issued from these seeds—an average of 92 beetles per seed. Since there are whole avenues of these date palms in the park and in other parts of Honolulu, there must be many thousands of these beetles breeding in the fallen seeds under the trees. This beetle is of no economic importance here as the date seeds are of no value. If they were of value they would be collected before being attacked by the beetles, as the latter attack the seeds as they are lying on the ground.

Another palm seed scolytid was sent to Dr. Van Dyke at the same time. A black species reared from seeds of *Livistona chinensis* at the Experiment Station grounds by J. S. Rosa, June 8, 1927. Dr. Van Dyke determined this as *Coccotrypes pygmaeus* (Eich.) (?). A large number of these issue from a single seed. It is of some economic importance when seeds of this palm are desired for planting.

Subsequent observations showed that both of these scolytids breed in other palm seeds as well. The appended list gives those that are at present known.

Coccotrypes dactyliperda reared from the following palm seeds:

Phoenix dactylifera: Kapiolani Park, September 22, 1927; Outrigger Club, September 24, 1927; Waialua, November 22, 1927; Pleasanton Hotel, November 28, 1927; Kamehameha Schools, December 8, 1927.

Livistona chinensis: Punahou Campus, November 28, 1927; Manoa Valley near Wodlawn, November 13, 1927.

Livistona rotundifolia: Honolulu, February 20, 1924 (H. L. Lyon).

Oreodoxa regia: Pleasanton Hotel, November 28, 1927.

Washingtonia filifera: Manoa Valley at the Pan-Pacific Scientific Research Institute, December 17, 1927.

Pritchardia pacifica: Kapiolani Park, December 18, 1927.

Coccotrypes pygmaeus (?) reared from the following palm seeds:

Phoenix dactylifera: Pearl City, about 1915.

Livistona chinensis: Experiment Station, H. S. P. A., June 8, 1927 (Rosa); Punahou Campus, December 18, 1927.

Sabal palmetto: Punahou Campus, December 9, 1927.

Sabal blackburniana: University of Hawaii, December 6, 1927.

Cocothrinax argentea: University of Hawaii, December 6, 1927.

Pritchardia thurstoni: University of Hawaii, December 6, 1927.

Some New Species of Lepidopterous Leaf-Miners in Hawaii

BY O. H. SWEZEY

(Presented at the Meeting of December 1, 1927)

The few leaf-miners included in this paper have been discovered in the last few years by the writer in his studies of the insect faunas of the native trees in the Hawaiian forests. In sending a considerable number of new species in various families to Mr. Meyrick for describing, these few leaf-miners were retained, as the writer having access to the types of close related species described by him a few years ago, considered that he could handle these later discovered ones to advantage.

Philodoria lysimachiella n. sp.

Head mouse gray, frons whitish; antennae mouse gray, whitish below on basal third, very long, about 1½ the length of wing; palpi white, slightly grayish externally on the apical half of middle joint, terminal joint infuscated in front. Thorax mouse gray, patagia ochraceous-orange. Forewings ochraceous-orange; a median white streak from base to near middle of wing lying slightly in front of the fold, bent dorsally in the outer fourth; a similar streak of the same length on the dorsal margin; from middle of costa a white band extends outwardly oblique to the dorsum at outer ⅔, dorsal half widened; at ¾ of costa a white spot extends dorsally nearly one-third across the wing; at beginning of costal cilia a white band extends across the wing very slightly inwardly oblique, in one specimen interrupted about ¼ from costa; a small white spot at tornus enclosed in a large black spot occupying all of the apex of wing beyond the last-mentioned white band except a patch of the ochraceous-orange ground color near costa and a few iridescent scales at extreme apex; all of the white bands and spots have a slight bluish iridescence and are margined by a few black scales. Cilia mouse gray, with a white spot at beginning of costal cilia, remainder of cilia with black scales at base. Hindwings mouse gray, slightly infuscated towards apex, cilia mouse gray. Abdomen mouse gray, whitish beneath. Legs mostly mouse gray, whitish beneath. Wing expanse, 8-9 mm.

Holotype in the collection of the Hawaiian Entomological Society; paratypes in author's collection, Bishop Museum and the U. S. National Museum.

Described from 9 specimens reared from leaf-mines in *Lysimachia rotundifolia*, collected January 16, 1927, on the windward slope of Puu Hapapa, about 2000 feet elevation, half a mile south from Kolekole Pass, Waianae Mts., Oahu (Swezey). Leaf-mines were once collected from Lysimachia on the top of the ridge back of Kalihi Valley, but no moths were reared from them.

Philodoria molokaiensis n. sp.

Very similar to *P. lysimachiella* except that the thorax has a longitudinal streak of ochraceous-orange on each side of disk, and the patagia are mouse gray instead of ochraceous-orange as in *lysimachiella;* the forewing differs in having an additional bluish-white streak which traverses the basal fourth of costa, then extends outwardly oblique across the wing; the median longitudinal is shorter and lies on the fold, whereas it is larger in *lysimachiella* and lies in front of the fold; the dorsal marginal streak is also shorter. Wing expanse, 9 mm.

Holotype and paratype in collection of Bishop Museum.

Described from 2 specimens reared from leaf-mines collected from *Lysimachia Hillebrandi* var., at Kawela, 3700 ft., Molokai, Dec. 23, 1925 (Swezey).

Leaf-mines have been collected on two occasions on *Lysimachia Hillebrandi* on the high plateau of Kauai, but no moths were reared from them. Probably when reared at some future time this will be another closely related species.

Parectopa touchardiella n. sp.

Head light buff, frons whitish; antennae light buff, infuscated on apical half, a little longer than forewing; palpi white, median joint slightly infuscated externally at apex, terminal joint infuscated in front. Thorax, abdomen and legs olive brown, pale beneath. Forewings olive brown, an outwardly oblique white bar at ¾ of costa, a few bluish scales at its terminus which is a little more than half way across wing; three small white costal spots between this bar and the apex; apical portion of wing beyond the white bar with a few yellowish scales, and a few bluish scales at extreme apex; dorsum with three large triangular white spots extending obliquely outward, from near base, at about middle and near tornus, respectively, the middle one longer and narrower reaching to middle of wing. Cilia olive brown, with three white spots in costal cilia alternating with black spots, terminal cilia with black band at base. Hindwings and cilia nearly uniform olive brown. Wing expanse, 6 mm.

Holotype and paratype in the collection of the Hawaiian Entomological Society.

Described from 2 specimens reared from leaf-mines collected from *Touchardia latifolia,* at 1800 ft. elevation, in Black Gorge, on the north side of Iao Valley, Maui, Jan. 15, 1926 (Swezey).

Very closely related to *P. neraudicola* (Sw.) and *P. urerana* (Sw.), reared from leaf-mines of *Neraudia melastomaefolia* and *Urera sandwicensis,* respectively. The wing pattern is much the same in all. In *urerana* the ground color is buff and it is a larger insect. In *neraudicola* the ground color is about the same as *touchardiella,* but the white dorsal spots are larger; the size of the two is about the same.

Parectopa pittosporella n. sp.

Head and thorax whitish (somewhat abraded above in the single specimen); antennae light ochreous brown, whitish at base, about 1¼ of wing; palpi whitish, a little brownish externally. Forewings light ochreous brown, a white bar from 4/5 of costa outwardly oblique half across wing, three white costal spots beyond this; a white dorsal streak on basal half of wing a little widened at 1/5, distad portion widened to fold, then with an oblique pointed extension continuing 2/3 across wing; another white streak on dorsum beginning at about 3/5 and continuing nearly to apex, an extension obliquely towards the end of white costal bar but not reaching it, a few brownish scales at tornus; a few bluish scales at apex; cilia grey. Hindwings and cilia greyish fuscous. Legs greyish fuscous, somewhat banded with whitish. Abdomen greyish fuscous. Wing expanse 8.5 mm.

Holotype male in the collection of the Hawaiian Entomological Society.

Described from a single male specimen reared from a cocoon found on leaf of Pittosporum about 3000 feet elevation on Mt. Kaala, Waianae range, Oahu, March 1, 1925 (Swezey). No mined leaves were found, hence it could be possible that Pittosporum was not the real host plant. The nearly continuous white streak on dorsum distinguishes this species from all other known species of Parectopa in Hawaii.

Since Mr. Meyrick maintains that the species of Gracilaria described by Walsingham in the Fauna Hawaiiensis, really belong to the genus Parectopa,* it may be useful to list them here as well as the species described under Gracilaria by myself.

Parectopa marginestrigata (Walsm.).

Gracilaria marginestrigata Walsm., Fauna Hawaiiensis, I, Part V, p. 721, Pl. XXV, Fig. 26, 1907.

Host plants: *Sida cordifolia, Sida rhombifolia, Sida fallax, Sida Meyeniana, Abutilon incanum, Abutilon molle, Xanthium strumarium* var. *echinatum.*

Parectopa epibathra (Walsm.).

Gracilaria epibathra Walsm., Fauna Hawaiiensis, I, Part V, p. 722, Pl. XXV, Fig. 27, 1907.

Host plant: *Dubautia laxa, Hesperomannia arborescens* and an undetermined Composite shrub at Kumuwela, Kauai. (The species that I have recorded as *epibathra* may be in error, as none of the specimens reared exactly agree with the figure of *epibathra* in the Fauna Hawaiiensis. These records may yet prove to be of an undescribed species.)

Parectopa mabaella (Swezey).

Gracilaria mabaella Swezey, Proceedings of the Hawaiian Entomological Society, II, 3, p. 89, Pl. 3, Fig. 6, 1910.

Host plants: *Maba sandwicensis* and *M. Hillebrandii.*

Parectopa hauicola (Swezey).

Gracilaria hauicola Swezey, Proc. Haw. Ent. Soc., II, 3, p. 100, Pl. 3, Fig. 5, 1910.

Host plant: *Paritium tiliaceum* (native name: hau).

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* See page 104, ante.

Parectopa dubautiella (Swezey).

Gracilaria dubautiella Swezey, Proc. Haw. Ent. Soc., II 5, P. 278, 1913.

Host plant: *Dubautia plantaginea.*

Parectopa hibiscella (Swezey).

Gracilaria hibiscella Swezey, Proc. Haw. Ent. Soc., II, 5, p. 279, 1913.

Host plants: *Hibiscus Arnottianus, Hibiscus rosa-sinensis* and varieties.

Parectopa ureraella (Swezey).

Gracilaria ureraella Swezey, Proc. Haw. Ent. Soc., III, 2, p. 94, 1915.

Host plant: *Urera sandwicensis.*

Parectopa urerana (Swezey).

Gracilaria urerana Swezey, Proc. Haw. Ent. Soc., III, 2, p. 95, 1915.

Host plant: *Urera sandwicensis.*

Parectopa neraudicola (Swezey).

Gracilaria neraudicola Swezey, Proc. Haw. Ent. Soc., IV, 2, p. 385, 1920.

Host plant: *Neraudia melastomaefolia, Pipturus albidus.*

Notes on Proterhinus (Coleoptera)

BY DR. R. C. L. PERKINS

(Presented by title by O. H. Swezey at the meeting of December 1, 1927)

In this paper I have enumerated a large number of specimens of *Proterhinus,* sent to me for examination by Mr. O. H. Swezey, by whom many of them were collected. The material here dealt with is from Oahu and Maui only, but some specimens from these Islands are still left for future consideration. These include *P. blackburni* Sh. with its varieties, races, or closely allied species and also *P. longulus* Sh. and closely allied forms. Until still more extensive series of these are collected from more numerous stations on all the Islands I do not think any satisfactory conclusion as to the importance or value of the different forms can be reached. In any case the specimens already collected, with special notes of the food plants and full data by Mr. Swezey and others, are a considerable help in this direction.

It may be noted that in some cases where I have assigned specimens to a species described by Dr. Sharp, I have stated that they are identical with specimens which I considered referable to such species, when I wrote the descriptions of *Proterhinus* for the Fauna Hawaiianeis in 1898, these being published later after my return to Honolulu. I have not, however, seen the actual types of Sharp's species since that time, as they were not accessible when I described supplementary species for that work in 1907, and on two recent occasions these types were not to be found in the British Museum ,where they belong, and some doubt existed as to whether they had ever been received there. I find it necessary to refer to this matter because, in my earliest paper on the genus, I sometimes referred to previously described species, specimens of my own catching, which differed more or less considerably from the actual types and possibly did not belong to the same species as these. At that time Dr. Sharp himself informed me that finally he was obliged to give up describing material sent to him by Blackburn since he was unable to decide whether the specimens sent later were distinct species or varieties of those he

had already described. My own doubts and difficulties in so difficult a study were naturally very great, since I was then a mere beginner at the study of Coleoptera, and, until I have again examined the types, I cannot feel at all certain that I have correctly interpreted all of Sharp's species.

A. Species Found on Oahu.

Proterhinus swezeyi Perkins.

Of this species, originally described from a single specimen, I have now examined nine additional examples, the smallest of which are only about half the size of the largest (length 3-5 mm.). Naturally, therefore, it varies in other characters and the conical production backwards of the eyes is not or hardly visible in one specimen. The transverse ridge formed by the constriction of the head behind the eyes is usually absent or indistinct in the middle, but in some specimens there is not much difference between the species and *deinops* in this respect. The sculpture of the rostrum and its form, as well as the long second antennal joint and other characters, show that this species should be placed in the group of *blackburni* Sh. Of the nine specimens now examined, three, all large, were found on Mt. Kaala on *Broussaisia,* 14. viii. *27*, and six at Kahana in the Koolau Range on the same plant, 4. ix .*27*, these varying greatly in size. All these were captured by Mr. Swezey, who informs me that the capture of the original specimen on *Pritchardia* was no doubt accidental and that the species is certainly really attached to *Broussaisia.*

Proterhinus podagricus Perkins var. **coprosmae** nov.

A single ♂, not fully mature but in fine condition, is entirely red with darker spots noticeable on the elytra, so that I doubt whether the femora would ever have become dark or black as in typical *podagricus.* The antennae are entirely red, at most of a still paler shade basally. So far as I can see, this specimen differs chiefly from the typical form in the conspicuously less dilated hind femora. Such specimens of *podagricus* as I am now able to examine are themselves variable, and were collected indiscriminately, without note of food plants, so it is quite possible that *kamptarthrus* and *podagricus* are representatives of a group of species, subspecies or races, which differ in habits and in some points of structure. Thus in my *podagricus* I detect differences in the antennae, and in one ♂ the scape is unusually long and comparatively slender, like that of a ♀ but whether these differences are mere casual aberrations or of more importance is at present uncertain. This var. *coprosmae* might be equally well referred to *kamptarthrus* as a variety, as it appears to me.

Hab.—Oahu, Mt. Kaala, 11.i.20. A single specimen on *Coprosma* (Swezey).

Proterhinus coprosmicola sp. nov.

In general appearance this species resembles *P. ruficornis, euphorbiae* and the red forms of *vestitus*, etc., the elytra at least, or even the whole insect, being red, the head and thorax as well as the femora being no doubt often more or less dark or suffused in old specimens, the elytra with some dark spots. The antennae are of moderate length and entirely red, the ninth joint distinctly less wide, but subequal in length to the tenth, the basal joint stout and very setose, not differing much in the sexes. The eyes are prominent, but decidedly small for the size of the insect. The clothing gives the pronotum a somewhat rough appearance, but is not dense, nor does it form any conspicuous maculations; the surface is slightly depressed along the middle and the pair of round impressions are distinct. The elytra are nearly parallel-sided on their basal two-thirds, with golden, or in old specimens greyish, appressed clothing, and with conspicuous erect, white (or very pale) setae, the humeral angles very distinct and appearing more or less sharp, though not much produced; the basal tubercles on either side of the scutellum are distinct. The basal abdominal segment beneath is coarsely punctured. The antennal club is less developed than that of *ruficornis* and the eyes are smaller, the elytra are less narrow and elongate than in *euphorbiae* and the hind angles of the pronotum are not distinct as in *vestitus*.

Hab.—Oahu, Pacific Heights, 1600 ft. on *Coprosma* (Bridwell) four examples, three very fresh or immature, one being headless and one older specimen covered with excretion and with the legs partly wanting.

Proterhinus vestitus Sharp.

Six examples of this polyphagous species are very red in color or immature in appearance. They were collected on the 'Arboretum Trail,' 3. x .26 by Swezey from *Bobea*, not, I think, a common food-plant of this species; I had once a series of similarly red-colored specimens from *Pipturus*, though usually this tree produces darker varieties. Eight specimens from Nuuanu Pali, 28. vi. 17, on 'Ti,' a well-known food plant of the species, collected by Bridwell, are typical in color.

Proterhinus angularis Sharp.

Eight examples collected by E. H. Bryan, Jr., in Palolo, 28. ii. 1920, I refer to the above species, though some at least of the specimens are hardly typical. Seven from Manoa, 14. vi. 23 (Swezey) like the above are not thoroughly typical. The species is confined to *Straussia*, on which all these specimens were taken,

and I believe it occurs only in the mountains within a few miles of Honolulu, especially in Palolo and neighboring valleys or in parts adjoining these valleys.

Proterhinus subangularis Perkins.

A single female from Kaala, 14. viii. 27 (Swezey) has the elytra unusually wide, but is best referred to this form, which is not infrequent in the Waianae Mountains. It was found on *Broussaisia,* but no doubt accidentally, since it breeds always on *Straussia.*

Proterhinus obscuricolor Perkins.

Four specimens taken from *Pelea* on the Woodlawn Trail, 1. v. 27 and one from Tantalus, 21. v. 25 (Swezey) are clearly the minute form which I considered (F. H. III, p. 660) to be a variety of the above-named species. Comparatively well-developed examples of *obscuricolor,* similar to individuals obtained from *Straussia,* are sometimes found with these small specimens on *Pelea.* Three examples, two from Kaumuahona (Bridwell and Bryan) largely abraded and one from Palolo in bad condition (Bridwell) appear to be the larger sized *obscuricolor.*

Proterhinus oxygonias Perkins.

A single female, Kuliouou, 5. iii. 20 (Swezey) without further data, agrees well with specimens I have named as above. It approaches very closely to some varieties of *excrucians* on the one hand, and to *heterostictus* on the other.

Proterhinus impressiscutis Perkins.

Originally described from a single female from Mt. Kaala, but I referred to specimens covered with exudation in my collection as probably belonging to this species. One of these when cleaned proved to be a very good specimen of the ♂, which except for the sexual characters resembles the ♀. I have now received another ♀ from Kaala, 18. ii. 23, on *Euphorbia* (Swezey).

Proterhinus impressiscutis var. **nudior** nov.

Four specimens from Lanihuli, near Honolulu, 24. xi. 18, and one dated 19. x. 19, together with two from Kuliouou, 22. xii. 18, all collected on *Euphorbia* by Swezey belong to a distinct race or variety. The elytra are without the short erect setae, which, though sparse, are very noticeable on the apical part and around the margins in the typical form. In the ♂ the impression around the scutellar region is short, but in the ♀ forms a very elongate triangle extending back along the suture.

Proterhinus euphorbiae Perkins.

Two females very fresh or perhaps not fully mature, as in one the dark spots on the elytra have not appeared and the antennae are very pale throughout. Otherwise they resemble the original examples of this little-known species. Both were taken from *Euphorbia* on Lanihuli, 24. xi. 18, by Swezey.

Proterhinus squamicollis Perkins var. **moestus** nov.

Under this name I have long had a *Proterhinus* taken in the Koolau range near Honolulu without note of habits, but occurring at about 2000 ft. It differs from *squamicollis* in the absence of the distinct transverse constriction of the head behind the eyes and in less dense appressed clothing, especially of the pronotum. The antennae are black, at most with an obscure reddish tinge at the base; the legs also are very dark, with the tarsal lobes black or piceous. The elytra have the basal tubercules on either side of the scutellum very conspicuous from their dense white clothing, while they themselves appear blacker than in the typical form owing to the appressed clothing being less abundant.

On 11. vi. 24 Mr. Swezey obtained a single ♀ of this variety from dead *Pelea* at Lanipo, and, if this be the correct food-plant, the acquisition of material for a more complete study may be facilitated by this knowledge. Typical *squamicollis* was taken by me on several occasions from dead *Bobea* branches, and I have no record of any other tree producing it.

Proterhinus platygonioides Perkins.

A female was taken on *Suttonia* at Kanehoa, Waianae Mountains, 16. i. 27 (Swezey) and this will probably prove to be the correct food-plant.

Proterhinus obscurus Sharp.

The varieties of this polyphagous species are not as a rule very distinct or sharply defined and owing to the absence of any striking characters, some specimens are very difficult. Five examples on *Bobea* and three from *Elaeocarpus* were taken by Swezey on Mt. Tantalus, and two from *Perrottetia,* 5. iv. 19 on the Cooke Trail.

Five from *Euphorbia,* 19. x. 19, one 24. ix. 18, and one 21. iv. 18, all on Lanihuli (Swezey); one on the same plant, Kaala, 18. ii. 23 (Swezey) and one on *Euphorbia clusiaefolia,* Kaumuahona, 17. vi. 17 (Bridwell) all appear to belong to var. *chryseis.*

Proterhinus pusillus Sharp.

At the time when my first paper on *Proterhinus* was written I was not able to match Sharp's type of *pusillus* with any of my own specimens and since then I have not been able to re-examine the type. The specimens here referred to are similar to those I referred to *pusillus* Sh. Five examples from *Pelea,* Mt. Tantalus, 21. vi. 25 and a pair from the same tree in Manoa; 1 ♀ Moanalua, 8.ii.20, without note of food plant (Swezey).

Proterhinus oscillans Sharp.

This species, so far as I know, is confined to *Acacia koa* and only accidentally found on other trees. Palehua, Waianae Range, 7.v.22 (Swezey), three on koa in company with three others which might be a dark from of this or referable to a form of *P. deceptor.* One in Rooke Valley, 24. xi. 18 (Swezey).

Proterhinus deceptor Perkins.

Three on koa, 7.v.22, Palehua (Swezey) as referred to under the preceding species.

Proterhinus deceptor var. **clermontiae** nov.

Four examples taken from a *Clermontia* in Pauoa, July, 1917, (Bridwell) I refer to *deceptor* as a variety with much doubt. The specimens are probably not fully mature being ferruginous or rufescent all over; the middle of the pronotum and the elytra along the suture would probably be more or less dark in mature individuals. The clothing is golden, on the elytra to a large extent more silvery, as well as at the hind angles of the pronotum, where a dense pale spot is evident on each side. The antennae are red, in old specimens no doubt more or less dark apically. The structure in general hardly differs from that of some specimens of *deceptor, subdeceptor* and other allied species.

Proterhinus abnormis Perkins.

A large series was taken by Swezey at Punaluu, 20.ii.21, on *Broussaisia.* So much variation is shown that I think these specimens connect the Kaala specimens of true *abnormis* with those obtained in the mountains near Honolulu, which were considered distinct by me and named *phyllobius.* This leaf-mining species has, apart from the rostral character, a slightly peculiar facies, which I remember to have observed in casually collected, single examples captured on Molokai, Maui and Hawaii. It is probable therefore that *Proterhinus* with similar habits and closely allied to, but distinct from, the Oahu form will be found on these Islands.

Proterhinus maurus Perkins.

Four examples were taken by Mr. J. C. Bridwell in Palolo, 14.vi.17, on *Suttonia,* which, no doubt, is the true food-plant though the first specimen obtained I took on *Pelea* in the mountains near Waialua. The individuals vary much in size, but it is always a large species and usually very large for the genus.

B. Species Found of Maui.

Proterhinus epichrysus Perkins.

Seventeen on *Rubus* from Olinda, 27.ii.26, and 1 ♀ on *Alyxia,* 14.vi.27 (Swezey) are similar to the original specimens from *Rubus. P. lanaiensis,* which I believe occurs also on Molokai, is excessively close to the above species, if not identical with it, but the specimens were not taken from *Rubus.*

Proterhinus humeralis Sharp.

A single specimen from *Rubus,* in company with the preceding, appears to be a rather broad example of *humeralis,* or at least identical with specimens which I referred to Sharp's species.

Proterhinus subangularis Perkins.

Four specimens from *Straussia* in the Iao Valley, 15.i.26 (Swezey).

Proterhinus punctipennis Sharp.

Eight specimens at Olinda, 13.v.26, and one 27.ii.26 on koa (Swezey) also one on *Rubus* on the latter date, probably accidentally present on this plant, since it is specially attached to *Acacia koa.* Specimens very similar to *punctipennis* and found on other trees were possibly referred by me to this species in my earlier collections, but more probably belong to others.

Proterhinus lecontei Sharp.

A single ♂ on *Rubus* at Olinda, 27.ii.26 (Swezey) was probably accidentally present on that plant, as I found the species abundantly, but only on one kind of tree or bush, the name of which I forget, but much *Rubus* grew with it.

Proterhinus sharpi Perkins.

Two specimens from the Keanae Gap on Haleakala, 7.viii.19 (C. N. Forbes) without note of food plant and one at Olinda,

13.v.26 (Swezey) on *Cibotium*. The original specimens were taken from a very different fern, and not from the tree-ferns.

Proterhinus deceptor Perkins.

Many specimens were taken by Swezey from the introduced weed, pamakani, in March, 1924, in the Iao Valley and a few from Waikapu. In the former locality it occurred 15.i.26 on *Bobea,* five specimens, and two on *Pipturus;* one on *Cyrtandra,* Waihee, 1.iii.26.

Immigrant Records for 1927

BY THE EDITOR

The following immigrant insects are recorded in this issue for the first time as occurring in Hawaii. Probably the most of them have been present for some time in the Islands, but have escaped notice until recently and are now recorded for the first time. For details of records, etc., refer to the pages given:

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Some of the new species of thrips described by Moulton, pages 105 to 134, and occurring on lowland plants may also be immigrants, but are not listed here.